Australian Government

UEE11 Electrotechnology Training Package

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INDUSTRY SKILLS COUNCILS
Creating Australia's Future

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UEE11 Electrotechnology Training Package

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Version	Release Date	Authorisation	Comments
1.5 UEE11		ISC Upgrade	**New Skill Sets** UEESS00129 - Apply currency of safe working practices and compliance verification of electrical installations UEESS00130 - Apply compliance requirements to all aspects of electrical work **Qualifications** The following qualifications have been amended to include updated units, electives and/or editorial changes. UEE40611; UEE50411; UEE60411 **Editorial amendments to units;** UEENEEG172A; UEENEEH111A; UEENEEH113A; UEENEEH116A; UEENEEH127A; UEENEEH129A; UEENEEH130A; UEENEEH131A; UEENEEH132A; UEENEEH133A; UEENEEH134A; UEENEEH138A; UEENEEJ109A; UEENEEJ111A; UEENEEJ112A; UEENEEJ113A; UEENEEJ114A; UEENEEJ115A; UEENEEJ116A; UEENEEJ117A;

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			UEENEEJ118A; UEENEEJ119A; UEENEEJ120A; UEENEEJ121A; UEENEEJ122A; UEENEEJ123A; UEENEEJ124A; UEENEEJ125A; UEENEEJ126A; UEENEEJ127A; UEENEEJ128A; UEENEEJ129A; UEENEEJ130A; UEENEEJ131A; UEENEEJ132A; UEENEEJ133A; UEENEEJ134A; UEENEEJ135A; UEENEEJ136A; UEENEEJ137A; UEENEEJ138A; UEENEEJ139A; UEENEEJ141A; UEENEEJ142A; UEENEEJ143A; UEENEEJ144A; UEENEEJ145A; UEENEEJ146A; UEENEEJ147A; UEENEEJ148A; UEENEEJ149A; UEENEEJ151A; UEENEEJ153A; UEENEEJ154A; UEENEEJ155A; UEENEEJ156A; UEENEEJ157A; UEENEEJ158A; UEENEEJ159A; UEENEEJ161A; UEENEEJ164A; UEENEEJ165A; UEENEEJ166A; UEENEEJ167A; UEENEEJ170A; UEENEEJ171A; UEENEEJ173A; UEENEEJ175A; UEENEEJ176A; UEENEEJ177A; UEENEEJ179A; UEENEEJ180A; UEENEEJ181A; UEENEEJ182A; UEENEEJ183A; UEENEEJ185A; UEENEEJ186A; UEENEEJ187A; UEENEEJ188A; UEENEEJ189A; UEENEEJ190A; UEENEEJ191A; UEENEEJ192A; UEENEEJ194A; UEENEEM019A; UEENEEM020A; UEENEEM021A; UEENEEM022A; UEENEEM023A; UEENEEM024A; UEENEEM025A; UEENEEM026A; UEENEEM027A; UEENEEM028A; UEENEEM029A; UEENEEM030A; UEENEEM031A; UEENEEM032A; UEENEEM033A; UEENEEM034A; UEENEEM035A; UEENEEM036A; UEENEEM037A; UEENEEM038A; UEENEEM039A; UEENEEM040A; UEENEEM041A; UEENEEM042A; UEENEEM043A; UEENEEM044A;

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			UEENEEM045A; UEENEEM046A; UEENEEM047A; UEENEEM048A; UEENEEM049A; UEENEEM050A; UEENEEM054A; UEENEEM055A; UEENEEM056A; UEENEEM057A; UEENEEM058A; UEENEEM059A; UEENEEM060A; UEENEEM061A; UEENEEM062A; UEENEEM063A; UEENEEM064A; UEENEEM065A; UEENEEM066A; UEENEEM074A; UEENEEM075A; UEENEEM080A
1.4 UEE11	17 Apr 2014	ISC Upgrade	**Qualifications** The following qualifications have been amended to include updated units, electives and editorial changes. UEE10111; UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50211; UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011 **Editorial amendments to units;** UEENEEM043A; UEENEEM044A; UEENEEM045A; UEENEEM046A

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			Training.gov.au metadata amendments to skill sets; UEESS00048; UEESS00049; UEESS00050; UEESS00051; UEESS00052; UEESS00053
1.3 UEE11	07 Sept 2013	ISC Upgrade	**Qualifications** The following qualifications have been amended to include updated units, electives and editorial changes. UEE20511; UEE21211; UEE21911; UEE30111; UEE30311; UEE30411; UEE30911; UEE61711 **Editorial amendments to units** UEENEEP010A. **Editorial amendments to Skill Sets:** UEESS00123; UEESS00124. Amended table 2 of unit relationships to reflect correct mapping.
1.2 UEE11	13 August 2013	ISC Upgrade	**Qualifications** All qualifications have had a new release made to include Core/Elective mapping on TGA. The following qualifications have been amended to include updated units, electives and editorial changes. UEE30811; UEE30911; UEE31211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE43011; UEE43111; UEE43211; UEE50111; UEE50211; UEE50411; UEE50511; UEE50711; UEE50911; UEE51011; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61511; UEE62011; UEE62111; UEE62211; UEE63011.

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			Editorial amendments to units UEENEEE119A; UEENEEE141A; UEENEEG106A; UEENEEH113A; UEENEEI102A; UEENEEI103A; UEENEEI104A; UEENEEI105A; UEENEEI106A; UEENEEI119A; UEENEEI120A; UEENEEI123A; UEENEEI128A; UEENEEI129A; UEENEEI130A. The phrase " For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2" has been removed from all units it was found. **New Skill Sets:** The following new Skill Sets have been created to meet industry and regulatory requirements UEESS00113 – Hazardous Areas – Electrical equipment in dust atmospheres UEESS00114 – Hazardous Areas – Electrical equipment in gas atmospheres UEESS00115 – Hazardous Areas – Electrical equipment in hazardous areas – pressurisation UEESS00116 – Data Communications – Premises Cabling for NBN Rollout UEESS00117 – Hazardous Areas – Design and Classification UEESS00118 – Data Communications – Plan an integrated cabling installation system UEESS00119 – Data Communications – Test, report and rectify faults in data and voice installations UEESS00120 – Data Communications – Plan an integrated cabling installation system – Electricians UEESS00121 – Hazardous Areas – Inspect, repair

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			and test reeling, trailing and flexible cables UEESS00122 – Hazardous Areas – Verifying compliance of repaired reeling, training and flexible cable UEESS00123 – Sustainable – Electrical Installations Sustainability Strategies UEESS00124 – Instrumentation – Programmable control systems
1.1 UEE11	7 March 2013	ISC Upgrade	**Qualifications** The following qualifications have been amended to include updated imported units, electives and editorial changes. UEE20111; UEE20411; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21711; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31311; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50211; UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511. **New Skill Sets:** **The following new Skill Sets have been created to meet industry and regulatory requirements** UEE11 Restricted - Attachment of cords and plugs to single phase low voltage electrical equipment UEE11 Restricted - Attachment of cords/cables and plugs to low voltage three phase electrical

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			equipment. UEE11 Restricted - Electrical safety testing of electrical cord connected equipment and cord assemblies UEE11 Restricted - Disconnection/ reconnection of fixed wired low voltage appliances UEE11 Restricted - Disconnection/ reconnection of fixed wired low voltage composite appliances UEE11 Restricted - Disconnection/ reconnection of fixed wired low voltage control devices UEE11 Restricted - Disconnection/ reconnection of fixed wired low voltage water heaters UEE11 Restricted - Disconnection/ reconnection of fixed wired low voltage motors UEE11 Hazardous Areas – Inspect, repair and test reeling, trailing and flexible cables UEE11 Hazardous Areas – Testing and verifying compliance of reeling, trailing and flexible cables **Skill sets amended:** All existing skill sets in the package have had their requirements mapped to ensure correct presentation on Training.gov.au **Units Imported** CPPBDN5013A; **Imported Units updated to current unit** HLTCPR211A; HLTFA311A; MSS402001A; MSS402021A; MSS402080A; MSS402081A; MSS402040A; MSS402020A; CPPFES2043A; TLILIC2001A; **Updated to the latest release** NWP209B; NWP210B; NWP218B; NWP226B; NWP227B; NWP229B; NWP243B; NWP245B; NWP247A; NWP253B; NWP255B; NWP256B; NWP257B; NWP259B; NWP260A; NWP261A; NWP262A; NWP263A; NWP268B; NWP276A. **Editorial amendments to Units**

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			UEENEED104A; UEENEEE117A; UEENEEG063A; UEENEEG105A; UEENEEI102A; UEENEEI103A; UEENEEI104A; UEENEEI105A; UEENEEI106A; UEENEEI107A; UEENEEI108A; UEENEEI110A; UEENEEI111A; UEENEEI112A; UEENEEI113A; UEENEEI114A; UEENEEI115A; UEENEEI116A; UEENEEI117A; UEENEEI118A; UEENEEI119A; UEENEEI120A; UEENEEI122A; UEENEEI123A; UEENEEI124A; UEENEEI125A; UEENEEI126A; UEENEEI127A; UEENEEI128A; UEENEEI129A; UEENEEI130A; UEENEEI131A; UEENEEI132A; UEENEEI133A; UEENEEI134A; UEENEEI135A; UEENEEI136A; UEENEEI137A; UEENEEI138A; UEENEEI139A; UEENEEI140A; UEENEEI141A; UEENEEI142A; UEENEEI143A; UEENEEI144A; UEENEEI145A; UEENEEI146A; UEENEEI147A; UEENEEI148A; UEENEEI148A; UEENEEI149A; UEENEEI150A; UEENEEI151A; UEENEEI152A; UEENEEI153A; UEENEEI154A; UEENEEI155A; UEENEEI156A; UEENEEI157A; UEENEEJ106A; UEENEEK104A; UEENEEK116A; UEENEEP017A;
1 UEE11	16 March 2012		All qualifications comply with the NQC's Packaging Rules for Flexibility Formula in that: a) All qualifications are core and elective only. b) Elective Units are listed in groups for each qualification and the schedule of electives removed from the package. c) All non regulated qualifications comprise a maximum two thirds core units and minimum one third elective, with provision for the importation of up to one sixth of the qualification as electives

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			from other sources. d) The NQC's formula provided for qualifications with regulated outcomes to be exempt from the core and elective ratios and the importation provisions. Thus all qualifications which have regulated outcomes are exempt from these provisions. **New Qualifications** UEE10111; UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50211; UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011; **Qualifications Amended** UEE20111; UEE32111; UEE32211; UEE42711; UEE42811; UEE42911; UEE51111; UEE51211; UEE62211; UEE62311; UEE62411; UEE62511 **Qualifications Removed** UEE20207; UEE20607; UEE21107; UEE21510; UEE31710; UEE31810; UEE31910; UEE42410; UEE61410 **New Units** A - Assembly units UEENEEA101A; UEENEEA102A;

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			UEENEEA103A; UEENEEA104A; UEENEEA105A; UEENEEA106A; UEENEEA107A; UEENEEA110A; UEENEEA112A; UEENEEA113A B – Broadcast Units UEENEEB101A D – Computer Systems Units UEENEED101A; UEENEED102A; UEENEED103A; UEENEED104A; UEENEED110A; UEENEED111A; UEENEED112A; UEENEED113A; UEENEED114A; UEENEED115A; UEENEED116A; UEENEED117A; UEENEED118A; UEENEED119A; UEENEED120A; UEENEED121A; UEENEED122A; UEENEED123A; UEENEED124A; UEENEED129A; UEENEED130A; UEENEED143A; UEENEED144A; UEENEED145A; UEENEED146A; UEENEED147A; UEENEED148A; UEENEED149A; UEENEED150A; UEENEED151A; UEENEED152A; UEENEED153A; UEENEED154A; UEENEED155A; E - Cross-Discipline units UEENEEE103A; UEENEEE108A; UEENEEE110A; UEENEEE114A; UEENEEE117A; UEENEEE118A; UEENEEE119A; UEENEEE121A; UEENEEE122A; UEENEEE123A; UEENEEE124A; UEENEEE127A; UEENEEE128A; UEENEEE129A; UEENEEE130A; UEENEEE131A; UEENEEE141A; UEENEEE142A; UEENEEE143A; UEENEEE144A; UEENEEE145A; UEENEEE146A; UEENEEE147A; UEENEEE148A; UEENEEE149A; UEENEEE150A; UEENEEE151A; UEENEEE152A; UEENEEE160A; UEENEEE161A; UEENEEE162A; UEENEEE163A; UEENEEE164A; UEENEEE179A; UEENEEE185A; UEENEEE190A;

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			UEENEEE191A; UEENEEE192A F - Data and Voice units UEENEEF101A; UEENEEF102A; UEENEEF103A; UEENEEF104A; UEENEEF105A; UEENEEF106A; UEENEEF107A; UEENEEF108A; UEENEEF109A; UEENEEF110A; UEENEEF111A; UEENEEF112A; UEENEEF113A; UEENEEF114A; UEENEEF115A; G - Electrical units UEENEEG110A; UEENEEG111A; UEENEEG113A; UEENEEG116A; UEENEEG118A; UEENEEG119A; UEENEEG120A; UEENEEG121A; UEENEEG122A; UEENEEG123A; UEENEEG124A; UEENEEG125A; UEENEEG126A; UEENEEG127A; UEENEEG128A; UEENEEG129A; UEENEEG130A; UEENEEG131A; UEENEEG132A; UEENEEG143A; UEENEEG144A; UEENEEG145A; UEENEEG150A; UEENEEG151A; UEENEEG152A; UEENEEG153A; UEENEEG154A; UEENEEG155A; UEENEEG156A; UEENEEG157A; UEENEEG158A; UEENEEG159A; UEENEEG160A; UEENEEG161A; UEENEEG162A; UEENEEG164A; UEENEEG165A; UEENEEG166A; UEENEEG167A; UEENEEG168A; UEENEEG169A; UEENEEG170A; UEENEEG172A; UEENEEG175A; UEENEEG177A; UEENEEG179A; UEENEEG180A; UEENEEG181A; UEENEEG182A; UEENEEG183A; UEENEEG184A; UEENEEG185A; UEENEEG186A; UEENEEG187A; UEENEEG188A; UEENEEG189A; UEENEEG197A; UEENEEG198A; UEENEEG199A; H - Electronic units UEENEEH101A; UEENEEH102A;

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			UEENEEH103A; UEENEEH104A; UEENEEH105A; UEENEEH106A; UEENEEH107A; UEENEEH108A; UEENEEH109A; UEENEEH110A; UEENEEH111A; UEENEEH112A; UEENEEH113A; UEENEEH114A; UEENEEH115A; UEENEEH116A; UEENEEH117A; UEENEEH118A; UEENEEH119A; UEENEEH120A; UEENEEH121A; UEENEEH122A; UEENEEH123A; UEENEEH124A; UEENEEH127A; UEENEEH128A; UEENEEH129B; UEENEEH130A; UEENEEH131A; UEENEEH132A; UEENEEH133A; UEENEEH134A; UEENEEH135A; UEENEEH136A; UEENEEH137A; UEENEEH138A; UEENEEH139A; UEENEEH140A; UEENEEH141A; UEENEEH142A; UEENEEH145A; UEENEEH146A; UEENEEH147A; UEENEEH148A; UEENEEH149A; UEENEEH150A; UEENEEH151A; UEENEEH152A; UEENEEH153A; UEENEEH154A; UEENEEH155A; UEENEEH156A; UEENEEH157A; UEENEEH158A; UEENEEH159A; UEENEEH160A; UEENEEH161A; UEENEEH162A; UEENEEH163A; UEENEEH164A; UEENEEH165A; UEENEEH166A; UEENEEH167A; UEENEEH168A; UEENEEH169A; UEENEEH171A; UEENEEH172A; UEENEEH173A; UEENEEH174A; UEENEEH175A; UEENEEH176A; UEENEEH177A; UEENEEH178A; UEENEEH179A; UEENEEH180A; UEENEEH181A; UEENEEH182A; UEENEEH183A; UEENEEH184A; UEENEEH185A; UEENEEH186A; UEENEEH187A; UEENEEH188A; UEENEEH189A; UEENEEH190A; UEENEEH191A; UEENEEH192A I – Instrumentation and Industrial Control

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			UEENEEI101A; UEENEEI102A; UEENEEI103A; UEENEEI104A; UEENEEI105A; UEENEEI106A; UEENEEI107A; UEENEEI108A; UEENEEI110A; UEENEEI111A; UEENEEI112A; UEENEEI113A; UEENEEI114A; UEENEEI115A; UEENEEI116A; UEENEEI117A; UEENEEI118A; UEENEEI119A; UEENEEI120A; UEENEEI121A; UEENEEI122A; UEENEEI123A; UEENEEI124A; UEENEEI125A; UEENEEI126A; UEENEEI127A; UEENEEI128A; UEENEEI129A; UEENEEI130A; UEENEEI131A; UEENEEI132A; UEENEEI133A; UEENEEI134A; UEENEEI135A; UEENEEI136A; UEENEEI137A; UEENEEI138A; UEENEEI139A; UEENEEI140A; UEENEEI141A; UEENEEI142A; UEENEEI143A; UEENEEI144A; UEENEEI145A; UEENEEI146A; UEENEEI147A; UEENEEI148A; UEENEEI149A; UEENEEI150A; UEENEEI151A; UEENEEI152A; UEENEEI153A; UEENEEI154A; UEENEEI155A; UEENEEI156A; UEENEEI157A J – Refrigeration and Air Conditioning Units UEENEEJ120A K – Renewable and Sustainable Energy Units UEENEEK101A; UEENEEK102A; UEENEEK103A; UEENEEK104A; UEENEEK105A; UEENEEK106A; UEENEEK107A; UEENEEK108A; UEENEEK109A; UEENEEK110A; UEENEEK111A; UEENEEK112A; UEENEEK114A; UEENEEK116A; UEENEEK117A; UEENEEK118A; UEENEEK120A; UEENEEK121A; UEENEEK122A; UEENEEK123A; UEENEEK124A; UEENEEK125A; UEENEEK127A; UEENEEK128A;

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			UEENEEK129A; UEENEEK130A; UEENEEK131A; UEENEEK132A; UEENEEK133A; UEENEEK134A; UEENEEK135A; UEENEEK136A; UEENEEK137A; UEENEEK138A; UEENEEK139A; UEENEEK140A; UEENEEK142A; UEENEEK143A; UEENEEK144A; UEENEEK145A; UEENEEK146A; UEENEEK148A; UEENEEK149A; UEENEEK151A; UEENEEK152A; UEENEEK153A; UEENEEK154A; UEENEEK155A N – Rail Signalling Units UEENEEN101A; UEENEEN102A; UEENEEN103A; UEENEEN104A; UEENEEN105A; UEENEEN106A; UEENEEN107A; UEENEEN108A; UEENEEN109A; UEENEEN110A; UEENEEN111A; UEENEEN112A; UEENEEN114A; UEENEEN116A; UEENEEN118A; UEENEEN121A; UEENEEN126A; UEENEEN127A; UEENEEN128A P – Restricted Electrical Units UEENEEP010A; UEENEEP011A; UEENEEP013A; UEENEEP014A; UEENEEP015A; UEENEEP016A; UEENEEP018A; UEENEEP019A; UEENEEP020A; UEENEEP021A; UEENEEP022A; UEENEEP023A; UEENEEP026A **Units Removed** UEENEEA001B; UEENEEA002B; UEENEEA003B; UEENEEA004B; UEENEEA005B; UEENEEA006B; UEENEEA010B; UEENEEA012B; UEENEEA013B; UEENEEB001B; UEENEEC015B; UEENEEC028B; UEENEEC029B; UEENEED001B; UEENEED002B; UEENEED003B; UEENEED004B; UEENEED005B;

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			UEENEED007B; UEENEED008B; UEENEED009B; UEENEED010B; UEENEED011B; UEENEED012B; UEENEED013B; UEENEED014B; UEENEED015B; UEENEED016B; UEENEED017B; UEENEED018B; UEENEED019B; UEENEED020B; UEENEED021B; UEENEED022B; UEENEED023B; UEENEED024B; UEENEED025B; UEENEED026B; UEENEED027B; UEENEED028B; UEENEED029B; UEENEED030B; UEENEED031B; UEENEED032B; UEENEED033B; UEENEED034B; UEENEED043B; UEENEED044B; UEENEED045B; UEENEED046B; UEENEED048B; UEENEED050B; UEENEED051B; UEENEED052B; UEENEED053B; UEENEED054B; UEENEED055B; UEENEEE001B; UEENEEE002B; UEENEEE003B; UEENEEE004B; UEENEEE005B; UEENEEE007B; UEENEEE008B; UEENEEE010B; UEENEEE014B; UEENEEE016B; UEENEEE017B; UEENEEE018B; UEENEEE019C; UEENEEE021B; UEENEEE022B; UEENEEE023B; UEENEEE024C; UEENEEE025B; UEENEEE026B; UEENEEE027B; UEENEEE028B; UEENEEE029B; UEENEEE030B; UEENEEE032B; UEENEEE033B; UEENEEE034B; UEENEEE035B; UEENEEE036B; UEENEEE037B; UEENEEE041B; UEENEEE042B; UEENEEE043B; UEENEEE044B; UEENEEE045B; UEENEEE046B; UEENEEE047B; UEENEEE048C; UEENEEE049B; UEENEEE050B; UEENEEE051B; UEENEEE060B; UEENEEE061B; UEENEEE062B; UEENEEE063B; UEENEEE064B; UEENEEE079A; UEENEEF002B; UEENEEF003B; UEENEEF004B; UEENEEF005B; UEENEEF006B;

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			UEENEEF007B; UEENEEF008B; UEENEEF009B; UEENEEF010B; UEENEEF011B; UEENEEF012B; UEENEEF013B; UEENEEF014B; UEENEEF015B; UEENEEF016A; UEENEEG001B; UEENEEG002B; UEENEEG003B; UEENEEG004B; UEENEEG005B; UEENEEG007B; UEENEEG008B; UEENEEG009B; UEENEEG010B; UEENEEG011B; UEENEEG012B; UEENEEG013B; UEENEEG015B; UEENEEG016B; UEENEEG018B; UEENEEG019B; UEENEEG020B; UEENEEG021B; UEENEEG022B; UEENEEG023B; UEENEEG024B; UEENEEG025B; UEENEEG026B; UEENEEG027B; UEENEEG028B; UEENEEG029B; UEENEEG030B; UEENEEG031B; UEENEEG032B; UEENEEG034B; UEENEEG035B; UEENEEG036B; UEENEEG037B; UEENEEG038B; UEENEEG039B; UEENEEG040B; UEENEEG041B; UEENEEG042B; UEENEEG043B; UEENEEG044B; UEENEEG045B; UEENEEG046B; UEENEEG047B; UEENEEG048B; UEENEEG049B; UEENEEG050B; UEENEEG051B; UEENEEG052B; UEENEEG053B; UEENEEG054B; UEENEEG055B; UEENEEG056B; UEENEEG057B; UEENEEG058B; UEENEEG059B; UEENEEG060B; UEENEEG061B; UEENEEG062B; UEENEEG064B; UEENEEG065B; UEENEEG066B; UEENEEG067B; UEENEEG068B; UEENEEG069B; UEENEEG070B; UEENEEG071C; UEENEEG072C; UEENEEG075A; UEENEEH001B; UEENEEH002B; UEENEEH003B; UEENEEH004B; UEENEEH005B; UEENEEH006B; UEENEEH007B; UEENEEH008B; UEENEEH009B; UEENEEH010B; UEENEEH011B; UEENEEH012B;

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			UEENEEH013B; UEENEEH014B; UEENEEH015B; EENEEH016B; UEENEEH017B; UEENEEH018B; UEENEEH019B; UEENEEH020B; UEENEEH021B; UEENEEH022B; UEENEEH023B; UEENEEH024B; UEENEEH025B; UEENEEH026B; UEENEEH027B; UEENEEH028B; UEENEEH029B; UEENEEH030B; UEENEEH031B; UEENEEH032B; UEENEEH033B; UEENEEH034B; UEENEEH035B; UEENEEH036B; UEENEEH037B; UEENEEH038B; UEENEEH039B; UEENEEH040B; UEENEEH041B; UEENEEH042B; UEENEEH043B; UEENEEH044B; UEENEEH045B; UEENEEH046B; UEENEEH047B; UEENEEH048B; UEENEEH049B; UEENEEH050B; UEENEEH051B; UEENEEH052B; UEENEEH053B; UEENEEH054B; UEENEEH055B; UEENEEH056B; UEENEEH057B; UEENEEH058B; UEENEEH059B; UEENEEH060B; UEENEEH061B; UEENEEH062B; UEENEEH063B; UEENEEH064B; UEENEEH065B; UEENEEH066B; UEENEEH067B; UEENEEH068B; UEENEEH069B; UEENEEH070B; UEENEEH071B; UEENEEH072C; UEENEEH073B; UEENEEH074B; UEENEEH075B; UEENEEH076B; UEENEEH077B; UEENEEH078B; UEENEEH079B; UEENEEH080B; UEENEEH081B; UEENEEH082B; UEENEEH083B; UEENEEH084B; UEENEEH085B; UEENEEH086B; UEENEEH087B; UEENEEH088B; UEENEEH090A; UEENEEH091A; UEENEEH092A; UEENEEI001B; UEENEEI002B; UEENEEI003B; UEENEEI004B; UEENEEI005B; UEENEEI006B; UEENEEI007C; UEENEEI008C; UEENEEI009B; UEENEEI010B; UEENEEI011B;

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			UEENEEI012B; UEENEEI013B; UEENEEI014B; UEENEEI015B; UEENEEI017B; UEENEEI019B; UEENEEI020B; UEENEEI021B; UEENEEI022B; UEENEEI023B; UEENEEI025B; UEENEEI026B; UEENEEI027B; UEENEEI028B; UEENEEI029B; UEENEEI030B; UEENEEI034B; UEENEEI035B; UEENEEI036B; UEENEEI037B; UEENEEI038A; UEENEEI040A; UEENEEI041A; UEENEEI042A; UEENEEI043A; UEENEEI044A; UEENEEJ002B; UEENEEJ003B; UEENEEJ004B; UEENEEJ005B; UEENEEJ006B; UEENEEJ007B; UEENEEJ008B; UEENEEJ009B; UEENEEJ010B; UEENEEJ011B; UEENEEJ013B; UEENEEJ015B; UEENEEJ018B; UEENEEJ019B; UEENEEJ020B; UEENEEJ021B; UEENEEJ053B; UEENEEJ067B; UEENEEJ070B; UEENEEJ072B; UEENEEK001B; UEENEEK002B; UEENEEK003B; UEENEEK004B; UEENEEK005B; UEENEEK006B; UEENEEK007B; UEENEEK008B; UEENEEK009B; UEENEEK010B; UEENEEK011B; UEENEEK012B; UEENEEK013B; UEENEEK014B; UEENEEK016A; UEENEEK017B; UEENEEK020B; UEENEEK021B; UEENEEK022B; UEENEEK023B; UEENEEK025C; UEENEEK026B; UEENEEK027B; UEENEEK028B; UEENEEK029B; UEENEEK030B; UEENEEK031B; UEENEEK032B; UEENEEK033B; UEENEEK034B; UEENEEK035C; UEENEEK036B; UEENEEK037B; UEENEEK038B; UEENEEK039B; UEENEEK040B; UEENEEK042A; UEENEEK043A; UEENEEK045A; UEENEEK046A; UEENEEK047A; UEENEEK048A; UEENEEK049A; UEENEEK050A;

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			UEENEEK051A; UEENEEN001B; UEENEEN002B; UEENEEN003B; UEENEEN004B; UEENEEN005B; UEENEEN006B; UEENEEN007B; UEENEEN008B; UEENEEN009B; UEENEEN010B; UEENEEN011B; UEENEEN012B; UEENEEN013B; UEENEEN014B; UEENEEN015B; UEENEEN016B; UEENEEN017B; UEENEEN018B; UEENEEN019B; UEENEEN020B; UEENEEN021A; UEENEEN025B; UEENEEN026B; UEENEEN027B; UEENEEN028B; UEENEEP001B; UEENEEP002B; UEENEEP003B; UEENEEP004B; UEENEEP005B; UEENEEP006B; UEENEEP007B; UEENEEP008B **Imported Units Added** NWP210B; NWP276A; PMASUP410B; UETTDRIS43A; UETTDRIS44A; UETTDRIS47A; UETTDRIS67A; UETTDRIS68A; UETTDRIS69A; UETTDRIS70A; UETTDRIS71A; UETTDRIS72A; UETTDRIS73A; UETTDRIS74A; UETTDRSB39A **Imported Units Removed** BSBITU306A; BSBSMB405A; ICTTEN3089A; ICTTEN4081A; ICTTEN4085A; ICTTEN5083A; PMBQUAL390A; TLIB2034A; TLIB3040A; TLIB3048A ; TLIB3053A; TLIB3058A; TLIB3103A; TLIB3407B; TLIB4007B; TLIB4807B; TLIB5307B; TLIB5807B; TLIS2020A; TLIS507B; TLIS807B; TLIS907B; TLIX1107B; TLIX1607B; UEPOPS234A; UEPOPS235A; UEPOPS236A
4 UEE07	31 July 2011	NQC	**New Qualifications** Embedding of Sustainability Skills units into the core of the following qualifications: Modification of the following qualifications to comply with NQC Packaging Rules. Incorporation of Engineers Australia requirements

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			for accreditation under the Dublin Accord New Qualifications UEE20110; UEE32110; UEE32210; UEE42710; UEE42810; UEE42910; UEE51110; UEE51210; UEE62210; UEE62310; UEE62410; UEE62510 Deleted Qualifications UEE20107; UEE21810; UEE30510; UEE31307; UEE41310; UEE42310; UEE42510; UEE50610; UEE60110; UEE60710; UEE61910 **New Units** **Cross Discipline Units** Amended Units UEENEEE011C New Units UEENEEE080A; UEENEEE081A; UEENEEE082A; UEENEEE083A; UEENEEE101A; UEENEEE102A; UEENEEE104A; UEENEEE105A; UEENEEE107A; UEENEEE125A; UEENEEE126A; UEENEEE137A; **Electrical Units** New Units UEENEEG006A; UEENEEG033A; UEENEEG063A; UEENEEG076A; UEENEEG101A; UEENEEG102A; UEENEEG103A; UEENEEG104A; UEENEEG105A; UEENEEG106A; UEENEEG107A; UEENEEG108A; UEENEEG109A; UEENEEG149A; UEENEEG171A; **Electronic and Communications Units** New Units UEENEEH091A; UEENEEH092A **Instrumentation Units** New Units

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			UEENEEI038A; UEENEEI040A; UEENEEI041A; UEENEEI042A; UEENEEI043A; UEENEEI044A; **Refrigeration and Air Conditioning Units** New Units UEENEEJ102A; UEENEEJ103A; UEENEEJ104A; UEENEEJ105A; UEENEEJ106A; UEENEEJ107A; UEENEEJ108A; UEENEEJ109A; UEENEEJ110A; UEENEEJ111A; UEENEEJ112A; UEENEEJ113A; UEENEEJ114A; UEENEEJ115A; UEENEEJ116A; UEENEEJ117A; UEENEEJ118A; UEENEEJ119A; UEENEEJ121A; UEENEEJ122A; UEENEEJ123A; UEENEEJ124A; UEENEEJ125A; UEENEEJ126A; UEENEEJ127A; UEENEEJ128A; UEENEEJ129A; UEENEEJ130A; UEENEEJ131A; UEENEEJ132A; UEENEEJ133A; UEENEEJ134A; UEENEEJ135A; UEENEEJ136A; UEENEEJ137A; UEENEEJ138A; UEENEEJ139A; UEENEEJ141A; UEENEEJ142A; UEENEEJ143A; UEENEEJ144A; UEENEEJ145A; UEENEEJ146A; UEENEEJ147A; UEENEEJ148A; UEENEEJ149A; UEENEEJ150A; UEENEEJ151A; UEENEEJ153A; UEENEEJ154A; UEENEEJ155A; UEENEEJ156A; UEENEEJ157A; UEENEEJ158A; UEENEEJ159A; UEENEEJ161A; UEENEEJ162A; UEENEEJ164A; UEENEEJ165A; UEENEEJ166A; UEENEEJ167A; UEENEEJ168A; UEENEEJ170A; UEENEEJ171A; UEENEEJ172A; UEENEEJ173A; UEENEEJ174A; UEENEEJ175A; UEENEEJ176A; UEENEEJ177A; UEENEEJ178A; UEENEEJ179A; UEENEEJ180A; UEENEEJ181A; UEENEEJ182A; UEENEEJ183A; UEENEEJ184A; UEENEEJ185A;

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			UEENEEJ186A; UEENEEJ187A; UEENEEJ188A; UEENEEJ189A; UEENEEJ190A; UEENEEJ191A; UEENEEJ192A; UEENEEJ193A; UEENEEJ194A; UEENEEJ195A; UEENEEJ196A; Deleted Units UEENEEJ012B; UEENEEJ014B; UEENEEJ016B; UEENEEJ017B; UEENEEJ022B; UEENEEJ023B; UEENEEJ024B; UEENEEJ025B; UEENEEJ026B; UEENEEJ027B; UEENEEJ028B; UEENEEJ029B; UEENEEJ030B; UEENEEJ031B; UEENEEJ032B; UEENEEJ033B; UEENEEJ034B; UEENEEJ035B; UEENEEJ036B; UEENEEJ037B; UEENEEJ038B; UEENEEJ039B; UEENEEJ041B; UEENEEJ042B; UEENEEJ043B; UEENEEJ044B; UEENEEJ045B; UEENEEJ046B; UEENEEJ047B; UEENEEJ048B; UEENEEJ049B; UEENEEJ050B; UEENEEJ051B; UEENEEJ052B; UEENEEJ054B; UEENEEJ055B; UEENEEJ056B; UEENEEJ057B; UEENEEJ058B; UEENEEJ059B; UEENEEJ061B; UEENEEJ062B; UEENEEJ063B; UEENEEJ064B; UEENEEJ065B; UEENEEJ066B; UEENEEJ068B; UEENEEJ071B; UEENEEJ073B; UEENEEJ074A; UEENEEJ075A; UEENEEJ076B; UEENEEJ077A; UEENEEJ078A; UEENEEJ079A; UEENEEJ080A; UEENEEJ081A; UEENEEJ082A; UEENEEJ083A; UEENEEJ084A; UEENEEJ085A; UEENEEJ086A; UEENEEJ087A; UEENEEJ088A; UEENEEJ089A; UEENEEJ090A; UEENEEJ091A; **Restricted Electrical Units** New Units

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			UEENEEP012A; UEENEEP017A; UEENEEP024A; UEENEEP025A; Deleted Units UEENEEP009B **Rail Signalling** New Units UEENEEN021A **Deleted Imported Units** Rationalisation of Rail Signalling units from TLI07 TLIB5007B; TLIB5107B; TLIB5207B; TLIB5407B; TLIB5507B; TLIB5607B; TLIB5707B; TLIB5907B; TLIB6207B; TLIB6307B; TLIB6407B; TLIB6507B; TLIB6607B; TLIB6707B; TLIB6807B; TLIB6907B; TLIS1007B; TLIS1107B; TLIS707B **Addition of the following Imported Units** RIIRA1609A; RIIRIS601A; RIIOHS202A; RIIOHS205A; RIIOHS204A; CPCOHS10001A; HLTCPR201A; HLTFA301A; TLILIC508A ; TLID3507C; PRMPFES43A; MEM16006A; MEM16008A; MEM30001A; MEM30002A; MEM30003A; MEM30004A; MEM05012C; MEM05007C; **Update of Existing Imported units** BSBWOR502B; BSBMGT516C BSBSMB405A; ICTTEN3056A; ICTTEN5083A; ICTTEN4085A; ICTTEN4081A; ICTTEN3089A;
3.1 UEE07	4 August 2010	EE-Oz ISC Upgrade Authorised by NQC to meet Packaging Rule requirements and the inclusion of Sustainability Skills in	Modification of the following qualifications to comply with NQC Packaging Rules. UEE10110 Certificate I in Electrotechnology UEE20510 Certificate II in Computer Assembly and Repair UEE21310 Certificate II in Remote Area Essential Service UEE21610 Certificate II in Security Assembly and

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		qualifications.	Setup UEE21710 Certificate II in Technical Support UEE21910 Certificate II in Electronics UEE22010 Certificate II in Electrotechnology (Career Start) UEE30210 Certificate III in Computer Systems Equipment UEE30310 Certificate III in Custom Electronics Installations UEE30910 Certificate III in Electronics and Communications UEE40110 Certificate IV in Computer Systems UEE40710 Certificate IV in Electronics and Communications UEE41510 Certificate IV in Video and Audio Systems UEE50110 Diploma of Computer Systems Engineering UEE50510 Diploma of Electronics and Communications Engineering UEE60210 Advanced Diploma of Electronics and Communications Engineering UEE60410 Advanced Diploma of Computer Systems Engineering Modifications to qualification to meet NQC requirements include: Stream Core requirement deleted from the above qualifications and stream core units included in core or elective to maintain qualification integrity. Inclusion of provision for importation of up to one sixth of total qualification points from other qualifications, other Training Packages and accredited courses. Inclusion of one third of total qualification points as elective. Creation of an imported and common units group

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			for each qualification. Creation of elective groups with specific qualification electives for each qualification. Application of a revised points weighting system for both core and elective units in each qualification. Embedding of Sustainability Skills units into the core of the following qualifications: UEE10110; UEE20510; UEE21310; UEE21610; UEE21710; UEE21910 UEE22010; UEE30210; UEE30310 UEE30910; UEE40110; UEE40710; UEE41510; UEE50110; UEE50510; UEE60210; UEE60410 Addition of the following Imported Units ICTTEN2207A Install and configure a home or small office network ICTTEN2208A Install and configure a small to medium business network ICTTEN2209A Build and maintain a secure network ICTTEN4210A Implement and troubleshoot enterprise routers and switches ICTTEN4211A Design, install and configure an internetwork ICTTEN4212A Apply advanced routing protocols to network design ICTTEN4213A Configure and troubleshoot advanced network switching ICTTEN4214A Install and maintain a wide area network
3 UEE07	11 June 2010	NQC	This review includes amendments to the UEE07 Electrotechnology Training Package as follows: Amendments to competency standard units: UEENEEE019C, UEENEEE024C,

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			UEENEEE048C, UEENEEH072C, UEENEEI007C, UEENEEI008C, UEENEEG072C (refer Vol 2,Part 2.1. and Table 2, Vol 2, Part 2), encompassing amendments to: Application of unit essential knowledge and skills clauses within the Cross Discipline (E) units Concurrent assessment and relationship with other units Due to the requirement for amendments to Prerequisites (and, consequently Prerequisite chains) Application of the unit essential knowledge and skills clauses correction to wording in range statement. 3. Hazardous Areas Units -Deletion of the following competency standard units due to amendments in the endorsed titles UEENEEM001B; UEENEEM002B, UEENEEM003B, UEENEEM004B, UEENEEM005B, UEENEEM006B, UEENEEM007B, UEENEEM008B, UEENEEM009B, UEENEEM010B, UEENEEM011B, UEENEEM012B, UEENEEM013B, UEENEEM014B, UEENEEM015B, UEENEEM016B, UEENEEM017B, UEENEEM018B The deleted competency standard units have been replaced with the following new competency standard units for Hazardous Areas (refer Vol 1, Part 1 and Vol 2, Part 2.1M); namely; UEENEEM019A, UEENEEM020A, UEENEEM021A, UEENEEM022A, UEENEEM023A, UEENEEM024A, UEENEEM025A, UEENEEM026A, UEENEEM027A, UEENEEM028A,

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			UEENEEM029A, UEENEEM030A, UEENEEM031A, UEENEEM032A, UEENEEM033A, UEENEEM034A, UEENEEM035A, UEENEEM036A, UEENEEM037A, UEENEEM038A, UEENEEM039A, UEENEEM040A, UEENEEM041A, UEENEEM042A, UEENEEM043A, UEENEEM044A, UEENEEM045A, UEENEEM046A, UEENEEM047A, UEENEEM048A, UEENEEM049A, UEENEEM050A, UEENEEM052A, UEENEEM053A, UEENEEM054A, UEENEEM055A, UEENEEM056A, UEENEEM057A, UEENEEM058A, UEENEEM059A, UEENEEM060A, UEENEEM061A, UEENEEM062A, UEENEEM063A, UEENEEM064A, UEENEEM065A, UEENEEM066A, UEENEEM067A, UEENEEM068A, UEENEEM069A, UEENEEM070A, UEENEEM071A, UEENEEM072A, UEENEEM073A, UEENEEM074A, UEENEEM075A, UEENEEM076A, UEENEEM077A, UEENEEM078A, UEENEEM079A, UEENEEM080A These units provide coverage of endorsements in the unit titles .e.g. coal mining. These contained re-numbered Hazardous Areas essential knowledge and skills clauses 4. Refrigeration and Air Conditioning Units Deletion of one unit UEENEEJ060B. Replaced by new unit UEENEEJ089A Addition of seventeen (17) new competency standard units for Refrigeration and Air Conditioning (refer Vol 1, Part 1 and Vol 2, Part 2.1); namely; UEENEEJ074A; UEENEEJ075A, UEENEEJ076A; UEENEEJ077A, UEENEEJ078A; UEENEEJ079A, UEENEEJ080A; UEENEEJ081A, UEENEEJ082A; UEENEEJ083A, UEENEEJ084A; UEENEEJ085A,

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			UEENEEJ086A; UEENEEJ087A, UEENEEJ088A; UEENEEJ090A; UEENEEJ091A, 5. Remote Areas and Renewable Energy Units Deletion of three (3) units: UEENEEK015B,UEENEEK024B, UEENEEK041B Replaced by Units: UEENEEK049A, UEENEEK050A, UEENEEK051A, Addition of two (2) new competency standard unit for Renewable and Sustainable Energy areas (refer Vol 1, Part 1 and Vol 2, Part 2.1); namely; UEENEEK016A; UEENEEK047A, Deletion of two (2) competency standard units for Renewable and Sustainable Energy Areas; namely; UEENEEK018B and UEENEEK019B – imported units for the Water Industry Training Package will cover the deleted units. (refer Vol 1, Part 1 and Vol 2, Part 2.1K) 6. Electrical Units Deletion of three (3) units: UEENEEE040B, UEENEEF001B, UEENEEG014B, These units have been replaced by the new units: UEENEEE079A, UEENEEF016A, UEENEEG075A, (refer Vol 2, Part 2.1. and Table 2, Vol 2, Part 2). 7. Instrumentation and Industrial Control Units

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			Addition of one (1) new competency standard unit for Instrumentation and Industrial Control areas: UEENEEE084A; (refer Vol 1, Part 1 and Vol 2, Part 2.1) 8. Electronic and Communications Units Addition of one (1) new competency standard unit for Electronics and Communications areas: UEENEEH090A. 9. Hazardous Area qualifications Amendments to Hazardous Area qualifications (refer Vol 1, Part 1 and Table 1, Vol, Part 1), encompassing: qualification structures amendments stemming from changes made to units and Prerequisites comprising the qualifications. The qualifications affected include: Revised Qualifications - UEE31710; UEE31810; UEE31910; UEE61210 Deleted Qualifications UEE41807 New Qualifications UEE42410, UEE42610, UEE61410 10. Refrigeration and Air conditioning qualifications Amendments to Refrigeration and Air conditioning qualifications (refer Vol 1, Part 1 and Table 1, Vol, Part 1), encompassing: qualification structures amendments stemming from changes made to units and Prerequisites comprising the

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			qualifications. The qualifications affected include Revised Qualifications UEE21810, UEE30510, UEE40510, UEE41310, UEE50310, UEE50610, UEE60710, Deleted Qualifications UEE41407, UEE60807, New Qualifications UEE42310, UEE42510, UEE61910, 11 Industrial Instrumentation and Control qualifications Amendments to Industrial Instrumentation and Control qualifications (refer Vol 1, Part 1 and Table 1, Vol, Part 1), encompassing: qualification structures amendments stemming from changes made to units and Prerequisites comprising the qualifications. The qualifications affected include: Revised Qualifications UEE31210, UEE40410, UEE40910, UEE50210, UEE50910, UEE60610, New Qualifications UEE42210, UEE51010, UEE61510, 12. Electronics, Communications and Computer Systems qualifications Amendments to Electronics, Communications and Computer Systems qualifications (refer Vol 1, Part 1 and Table 1, Vol, Part 1), encompassing: qualification structures amendments stemming from changes made to units and Prerequisites comprising the qualifications. The qualifications affected include:

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			Revised Qualifications UEE30310, UEE30910, UEE40110, UEE40710, UEE41510, UEE50110, UEE50510, UEE60210, UEE60410, Deleted Qualifications UEE60307, UEE60507, New Qualifications UEE61710, UEE61810, 13. Remote Areas and Renewable Energy qualifications Amendments to Renewable Energy qualifications (refer Vol 1, Part 1 and Table 1, Vol, Part 1), encompassing: qualification structures amendments stemming from changes made to units and Prerequisites comprising the qualifications. The qualifications affected include: Revised Qualifications UEE21310, UEE21510, UEE32010, UEE41610, UEE41010, UEE41910, UEE42010, UEE50710, UEE60910, Deleted Qualifications UEE61007, New Qualifications UEE62010, 14. Electrical qualifications Amendments to Electrical qualifications (refer Vol 1, Part 1 and Table 1, Vol, Part 1), encompassing: qualification structures amendments stemming from changes made to units and Prerequisites comprising the qualifications. The qualifications affected include: Revised Qualifications

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			UEE10110, UEE21610, UEE22010, UEE31410, UEE40210, UEE40310, UEE40610, UEE40810, UEE41110, , UEE50410, UEE50810, UEE60110, UEE61110, Deleted Qualifications UEE61307 New Qualifications UEE20810, UEE42110, UEE62110 15. Rail Signalling qualifications Amendments to Electrical qualifications (refer Vol 1, Part 1 and Table 1, Vol, Part 1), encompassing: qualification structures amendments stemming from changes made to units and Prerequisites comprising the qualifications. The qualifications affected include: UEE41710, UEE41210 16. All Qualifications – All pre-requisite competencies required to complete core competencies are explicitly included in core of the relevant qualification. 17. The following Imported Units have been added to UEE07 Version 3. NWP209B ; NWP218B ; NWP226B ; NWP227B ; NWP229B ; NWP243B ; NWP245B ; NWP247A ; NWP253B ; NWP255B ; NWP256B ; NWP257B ; NWP259B ; NWP260A ; NWP261A; NWP262A ; NWP263A; NWP268B ; TLIB3407B; TLIB4007B; TLIB4807B; TLIB5007B; TLIB5107B; TLIB5207B; TLIB5307B; TLIB5407B; TLIB5507B; TLIB5607B; TLIB5707B; TLIB5807B; TLIB5907B; TLIB6207B; TLIB6307B; TLIB6407B; TLIB6507B; TLIB6607B; TLIB6707B; TLIB6807B; TLIB6907B; TLIS507B; TLIS707B;TLIS1007B; TLIS1107B; TLIS807B;

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			TLIS907B; TLIX1107B; TLIX1607B; 18. The following imported units have been undated to the latest version from the parent Training Package. BSBSMB405A; BSBINM501A; BSBINM502A; BSBMGT502B; ICTTC056D; ICTTC083D; ICTTC085D; ICTTC088D; ICTTC089D; UETTDRIS04B; MSACMS200A; MSACMT220A MSACMT221A; MSACMT240A MSACMT280A; MSACMT281A Inclusion of Skill Sets for Energy Efficiency as follows: Energy Efficiency Auditor Identify of Energy Efficiency Strategies Energy Efficiency Systems Developer Energy Efficiency Systems Designer Energy Efficiency Systems Integration Inclusion of existing units in Electives Schedules: Added to Schedule 3 Electives: UEENEEP002B Schedule 3 Strand 2 UEENEEP003B Schedule 3 Strand 1
2 UEE07	12 August 2009	NQC	This review includes amendments to the UEE07 Electrotechnology Training Package as follows: **Qualifications** One new qualification UEE42010 Certificate IV in Electrical – Photovoltaic Systems Units in UEE42010 Certificate IV in Electrical – Photovoltaic Systems include: **New Unit** UEENEEK048A Install, configure and commission grid connected photovoltaic power systems This unit was developed to address the

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			requirements for commercial and domestic installations to meet the provisions of new Australian Government Renewable Energy initiatives and the requirements for Clean Energy Council accreditation for installers and/or designers of grid connected solar systems. **Modified units** UEENEEK025C Solve basic problems in photovoltaic energy apparatus UEENEEK035C Design grid connected power supply systems These units have been modified to address the requirements for commercial and domestic installations to meet the provisions of new Australian Government Renewable Energy initiatives and the requirements for Clean Energy Council accreditation for installers and/or designers of grid connected solar systems. UEENEEG071C Install and setup interval metering **Skills Sets** Post Trade Skill Sets have been identified for: • Installer of grid connected photovoltaic systems • Designer of grid connected photovoltaic systems • Designer and Installer of grid connected photovoltaic systems These Skill Sets have been designed to meet or exceed the requirements of the Clean Energy Council accreditation for Installer and/or designer of grid connected solar systems
1 UEE07	8 March 2008	NQC	This review includes amendments to the UEE07 Electrotechnology Training Package as follows: Amendments to Electronics and Computer Systems AQF 2 to 6 competency standard units with special emphasis on AQF 5 and 6 (refer Vol 2, Part 2.1H. Vol 2, Part 2.1D and Table 2, Vol 2, Part 2), encompassing amendments to: unit structures

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			Prerequisites (and, consequently Prerequisite chains) essential knowledge and skills clauses within the Electronics (H) and Computer Systems (D) discipline units Amendments to Electronics and Computer systems qualifications (refer Vol 1, Part 1 and Table 1, Vol, Part 1), encompassing: qualification structures amendments stemming from changes made to units and Prerequisites comprising the qualifications. The qualifications affected include: UEE20507 Certificate II in Computer Assembly and Repair UEE20907 Certificate II in Electronic Assembly UEE21907 Certificate II in Electronics UEE30207 Certificate III in Computer Systems Equipment UEE30307 Certificate III in Custom Electronics Installations UEE30507 Certificate III in Appliance Servicing UEE30907 Certificate III in Electronics and Communications UEE31107 Certificate III in Gaming Electronics UEE40107 Certificate IV in Computer Systems UEE40707 Certificate IV in Electronics and Communications UEE50907 Diploma of Industrial Electronics and Control Engineering UEE60307 Advanced Diploma of Electronic – Technology UEE60407 Advanced Diploma of Computer Systems Engineering UEE60507 Advanced Diploma of Computer Systems – Technology UEE60607 Advanced Diploma of Industrial

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			Electronics and Control Engineering Amendment of unit Prerequisites (refer Table 2, Vol 1, Part 2 and all Vol 2, Part 2.1) Amendment of the Regulatory/ Context of Assessment section in the Assessment Guidelines (refer Vol 1, Part 3) and the 'Critical Aspects of Evidence' section in each unit to better reflect jurisdictional regulatory requirements. Addition of two (2) new qualifications and related competency standard units for Renewable Energy (refer Vol 1, Part 1 and Vol 2, Part 2.1K); namely; UEE32007 Certificate III in Renewable Energy – ELV UEE41907 Certificate IV in Electrical – Renewable Energy Removal of 'UEENEEK025A Solve basic problems in photovoltaic energy apparatus' from core of UEE21507 Certificate II in Renewable Energy (refer Vol 1, Part 1) Inclusion of competency standard unit 'UEENEEK042A Participate in environmentally sustainable work practices' in the Stream Core of all Certificate II and Certificate III qualifications (refer Vol 1, Part 1) Inclusion of competency standard unit 'UEENEEK045A Implement & monitor, policies & procedures for environmentally sustainable electrotech work practice' in the Stream Core of all Certificate IV qualifications (refer Vol 1, Part 1) Inclusion of four new competency standard units for Renewable Energy and Sustainable Energy: UEENEEK042A; UEENEEK043A, UEENEEK045A, UEENEEK046A Amendment of EKAS alignments in competency standard unit 'UEENEEP001B Disconnect and reconnect fixed wired electrical equipment connected to a Low Voltage supply' (Refer Vol 2, Part 2.1P) Importation of Competitive Manufacturing units:

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			MCMS200A; MCMT220A; MCMT221A; MCMT240A; MCMT280A; MCMT281A (Refer Table 4,Vol 1, Part 2 for list of imported units & Vol 2, Part 2.1L for units) Incorporation of revised Mandatory text to ensure compliance with the November 2006 version of the Training Package Development Handbook (Refer all mandatory text sections in both Volumes) Revision of Unit Structures to ensure compliance with the November 2006 version of the Training Package Development Handbook (refer Vol 2, Part 2.1), including: Removal of all spaces within unit codes Addition of ‘1.1 Descriptor’ as a new title Relocation of ‘3.1 License to practise’ to position 1.2 Relocation of the sub-heading ‘2.1 Competencies’ from the left hand column to the right hand column Relocation of the sub-heading ‘2.2 Literacy and Numeracy skills’ from the left hand column to the right hand column Inclusion of the statement "For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2" in 2.1 Competencies Removal of all guidance text from 2) Prerequisite Unit(s), with the exception of the ‘M’ Hazardous Areas units Inclusion of ‘3) Employability Skills’ and the statement "The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements." as a whole new section Revision of the numbering of all subsequent sections to accommodate the inclusion of the Employability Skills section at 3)

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			Inclusion of the statement "All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies" as a new paragraph in ‘7) Required Skills and Knowledge’ Changing of the number ‘7’ in paragraph "Solve problems in complex polyphase power circuits as described in 7) and including:" in section 9.2 of the unit to 8. Complete removal of the ‘Key Competencies’ and ‘Skills Enabling Employment’ sections. Inclusion in of Employability Skills statement tables for all Qualifications (refer Volume 1, Part 1) Inclusion of full Prerequisite chain details for each unit (refer Table 2, Volume 1, Part 2). Technical and ‘Plain English’ edit of entire Training Package including minor editorial amendments across Training Package to correct spelling, grammatical and typographical errors. Amendment of all publishing-related information to UEE07, including; title pages, headers, footers, copyright statements, Training Package, qualification codes. Amendment of all unit codes to ‘UEENEE---B’. This is with the exception of the new units listed above, which have been coded ‘UEENEE---A’. Removal of the following text from units UEENEEM002B, UEENEEM004B, UEENEEM006B, UEENEEM007B, UEENEEM008B, UEENEEM009B, UEENEEM010B, UEENEEM011B, UEENEEM012B, UEENEEM014B, UEENEEM016B, UEENEEM017B, “The endorsement(s) for each explosion-protection technique is designated with an [Ex] as a suffix to the unit title”. Removal of the definition of ‘pre-requisite’ from Volume 1, Part 1, page 63. Revision of text within the following sections to

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			ensure currency and accuracy: Volume 1, Preliminary Information, Industry Coverage, Page 17. Volume 1, Part 1, Page 4. Volume 1, Part 1, Pages 42. Volume 1, Part 2, Page 236. Volume 1, Part 3, Appendix A. Volume 1, Part 3, Guide to Assessment Methods Table. Volume 1, Part 1, Qualifications Framework, Schedule of Electives. Replacement of all references to ‘Skills Clusters’ with ‘Skills Sets Replacement of all references to ‘prerequisites’ with ‘pre-requisites’ 22. Improved consistency of Volume 1, Part 3, Assessment Guidelines with Units via replacing ‘be consistent with the approved industry simulation policy’ with ‘be in accordance with industry and regulatory policy’. 23. Inclusion of ‘Schedule 6’ in the Elective Statement of the Packaging rules for UEE60207 Advanced Diploma of Electronics and Communications Engineering and UEE60407 Advanced Diploma of Computer Systems Engineering.

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Preliminary Information

Preliminary Information

The Electrotechnology Industry

The Electrotechnology industry is responsible for harnessing electricity to meet a huge variety of businesses and individual applications; ranging from traditional light and power to hardware platforms, networking automation, virtual enterprise, the internet and fibreoptics. It can truly be said that electrotechnology skills underpin the operation of the other industry sectors and the capacity of Australians to enjoy leisure activities.

Electrotechnology workers operate in an environment characterised by procedural regulation and occupational health and safety compliance. As the work is inherently dangerous, workers are expected to demonstrate high levels of competency, flexibility and capability across a wide range of equipment, technologies, processes and procedures. Workers are also expected to conduct continuous development of their knowledge and skills throughout their working life, in order to remain abreast of evolving technological and compliance related requirements.

In addition to their traditional role in facilitating work and play, workers in the electrotechnology industry will play an integral role in facilitating the transformation of the Australian economy in two important regards; both necessary to ensure its continued global competitiveness.

The first relates to the spread of new information processing and communication technologies, prime amongst these being the National Broadband Network (NBN). The NBN is the largest infrastructure project in the nation's history and will require an average of 25,000 local workers each year, during its eight year development period. Subsequently, improved communications infrastructure will support greater automation and industrial control technologies, allowing business and homes to use energy more intelligently, efficiently and effectively. Realising the full benefits of the NBN will require an electrotechnology workforce with higher level skills, increasing operating as dual ICT professionals.

The second relates to Australia's shift from a high carbon present toward a low carbon future. As community and business acceptance of the importance of effective and efficient energy usage grows, energy sector employees will be key disseminators of strategies and technologies for energy efficiency to all manner of end users, from business and government to individuals.

At the vanguard of this effort will be workers trained in monitoring, managing and measuring energy use based on effective assessment and data analysis. Coordinating and managing energy networks will drive demand for smart grids, automation and instrumentation technology, all of which will increase demand for post-trade electrical skills.

Moving to a more energy conscious future will also require electricians trained in auditing and reporting techniques, such as those required to calculate obligations under a carbon tax or emissions trading scheme.

As homes, communities and organisations become more energy conscious, investing in energy efficiency strategies and actively monitoring their usage patterns, not to mention industry's greater reliance on instrumentation and industrial control techniques to drive new technology, demand for electrotechnology skills will increase.

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Meeting these challenges will come on top of the industry's traditional mandate of ensuring that all Australian homes and businesses are able to utilise electricity effectively to address their needs. Developing the capacity to address each of these should be the industries top priority and will require a concerted training effort.
The industry:

- employs approximately 600,000 people, including approximately 170,000 in communication; 142,000 in installation trade services; 100,000 in construction and building maintenance; 25,000 electrical and electronic engineers; and 163,000 computer professionals (repair and servicing)
- covers more than 80 Qualifications from Certificate I through to Advanced Diploma.
- Occupations include; Electrician, Electrical Fitter, Electrical Mechanic, Electronics Technician, Communications Technician, Computer System Technician, Refrigeration and Air Conditioning Mechanic, Information Technology Technician, Instrumentation Technician, Data and voice Technician, and Telecommunications Technician. Often encompassing Licensing, Registration, Sustainable Energy certification, career paths or pathways, apprenticeships, training plans and agreements, and the completion of training and assessment processes to confirm competence by registered training organisations.

Industry Coverage

The Industry of ElectroComms (Electrotechnology-Communications) covers electronics, electrical, communications, control systems, instrumentation, lifts, refrigeration and air conditioning, and renewable/sustainable energy, fire and security, appliances, gaming and rail. The industry may also include some common technologies typically relevant to parts of telecommunications, data, and information technology and computing.
The Australian Standard Classifications of Occupation (ASCO) defines a number of occupations served by this Training Package.
The Electrotechnology group of skills does not coincide precisely with any of the Australian Bureau of Statistics (ABS) industries defined under the Australian and New Zealand Standard Industrial Classification (ANZSIC). There are several classes (4-digit ANZSIC) where the Electrotechnology skills predominate but there are also skilled Electrotechnology workers distributed across almost all industries. The industry sector that covers the largest group of electrical and electronic workers is the 'Installation trade services' (ANZSIC 423) group within the major industry division of construction. Additionally, a significant number of Electrotechnology workers are employed in the Telecommunications Industry.
Most vocations in this group have an entry level of skill commensurate with an AQF Certificate III or higher qualification. In some instances relevant experience is required in addition to a formal qualification. A large body of the skills and knowledge detailed in the competencies within this Training Package generally reside within the family of Electrotechnology vocations classified and grouped as occupations under ASCO (Australian Standards Classification of Occupation Code) by the Australian Bureau of Statistics (ABS).
Typical groups represented are as follows:
2125 Electrical and Electronics Engineers
2128-15 Electrical or Electronics Engineering Technologist
3123 Electrical Engineering Associate Professionals
3124 Electronic Engineering Associate Professionals
3294 Computing Support Technicians

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4311 Electricians
4312 Refrigeration and Air-conditioning Mechanics
4313 Electrical Distribution Tradespersons
4314 Electronic Instrument Tradespersons
4315 Electronic and Office Equipment Tradespersons
4316 Communications Tradespersons
4992-17 Broadcast Transmitter Operator
9212 Product Assemblers
9918 Electrical and Telecommunications Trades Assistants

The skills and knowledge contained within the Electrotechnology Training Package competencies are diverse and cover many of the Australian and New Zealand Standard Industrial Classifications (ANZSIC). In particular it embraces the following ANZSIC divisions:

- B Mining
- C Manufacturing
- D Electricity, Gas and Water Supply
- E Construction
- J Communication Services

Also represented are the following specific ANZSIC codes:

- 3610 Electricity Supply
- 4122 Non Building Construction
- 4232 Electrical Services
- 4233 Air Conditioning and Heating Services
- 4234 Fire and Security Systems Services
- 4615 Electrical and Electronic Equipment Wholesaling
- 5261 Household Equipment Repair (Electrical)
- 7823 Consultant Engineering Services

The Electrotechnology Training Package describes the skills and knowledge relevant to many vocations within the broad field of Electrotechnology rather than those of a particular industry or sector of industry. The Training Package offers a range of qualifications set out in competency standard units. Workers achieve the qualification through appropriate training or by seeking formal recognition of existing skills and knowledge. The prime objective of the Electrotechnology Training Package is to establish the standards of performance in terms of skills and knowledge required for safe, productive and satisfying work covering a broad range of work activities.

It is recognised that other training pathways may exist.

RTOs can develop appropriate industry approved training programs to meet the objectives of this or other Training Packages. Organisations and personnel seeking formal recognition have a choice of Training Package and of provider/RTO. Australian Apprenticeships which apply choice in relation to funding to RTOs will be facilitated by policy enunciated by State and Territory Training Authorities.

Regulatory arrangements

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The Electrotechnology Industry is subject to high levels of legislation, regulation, codes of practice, guidelines and advisory standards, related to: research, assembly, installation, construction, diagnoses, maintenance, commissioning, programming, testing and repair of networks; systems, circuits, equipment, components, appliances and facilities in the field of electricity and communications. The regulatory requirements are typically based on the principle of operation of wiring systems and associated circuits involving equipment, apparatus and systems, public safety, safety and health of individuals who work on lines/circuits, systems and apparatus/equipment and other codes and practices related to the environment in which they are installed, operate and are maintained.
Where possible, relevant and current regulatory requirements have been incorporated into this Training Package to assure outcomes are complementary to regulation. Where regulatory requirements are amended or introduced, such outcomes are to be incorporated in training and assessment programs. Continuous improvement and maintenance arrangements included in this Training Package are designed to keep pace with change.

Statutes, regulations and codes of practice

The Electrotechnology Industry is covered by Federal, State and Territory Electricity, Telecommunications, Occupational Health and Safety and Work Cover Acts and Regulations, as well as other statutes, regulations, industrial instruments, codes of practice, guidelines and advisory standards, Australian/New Zealand and International Standards.

Other Industry Standards

It is recognised that the Electrotechnology Standards do not cover all the competencies, likely to be required and applied within Electrotechnology Industry workplaces. Nationally endorsed competency standards from other industries will be used where appropriate and the concept of cross-industry disciplinary standards will be encouraged. Specific rules have been included within this Training Package to address these arrangements.

Overview

Overview

What is a Training Package?

A Training Package is an integrated set of nationally endorsed competency standards, assessment guidelines and Australian Qualifications Framework (AQF) qualifications for a specific industry, industry sector or enterprise.
Each Training Package:

- provides a consistent and reliable set of components for training, recognising and assessing peoples skills, and may also have optional support materials
- enables nationally recognised qualifications to be awarded through direct assessment of workplace competencies
- encourages the development and delivery of flexible training which suits individual and industry requirements

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- encourages learning and assessment in a work-related environment which leads to verifiable workplace outcomes.

How do Training Packages fit within the National Skills Framework?
The National Skills Framework applies nationally, is endorsed by the Ministerial Council for Vocational and Technical Education, and comprises the Australian Quality Training Framework 2010 (AQTF 2010) or Standards for NVR Registered Training Organisations 2012, and Training Packages endorsed by the National Skills Standards Council (NSSC).

How are Training Packages developed?
Training Packages are developed by Industry Skills Councils or enterprises to meet the identified training needs of specific industries or industry sectors. To gain national endorsement of Training Packages, developers must provide evidence of extensive research, consultation and support within the industry area or enterprise.

How do Training Packages encourage flexibility?
Training Packages describe the skills and knowledge needed to perform effectively in the workplace without prescribing how people should be trained.
Training Packages acknowledge that people can achieve vocational competency in many ways by emphasising what the learner can do, not how or where they learned to do it. For example, some experienced workers might be able to demonstrate competency against the units of competency, and even gain a qualification, without completing a formal training program.
With Training Packages, assessment and training may be conducted at the workplace, off-the-job, at a training organisation, during regular work, or through work experience, work placement, work simulation or any combination of these.

Who can deliver and assess using Training Packages?
Training and assessment using Training Packages must be conducted by a Registered Training Organisation (RTO) that has the qualifications or specific units of competency on its scope of registration, or that works in partnership with another RTO, as specified in the AQTF 2010 or Standards for NVR Registered Training Organisations 2012.

Training Package Components
Training Packages are made up of mandatory components endorsed by the NSSC, and optional support materials.

Training Package Endorsed Components

The nationally endorsed components include the Competency Standards, Assessment Guidelines and Qualifications Framework. These form the basis of training and assessment in the Training Package and, as such, they must be used.

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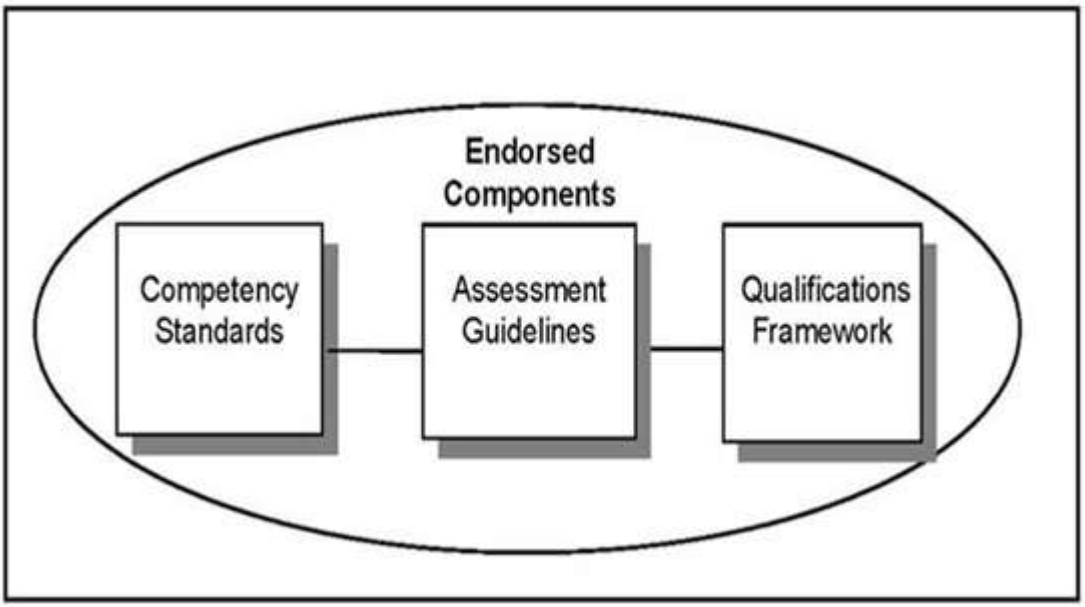

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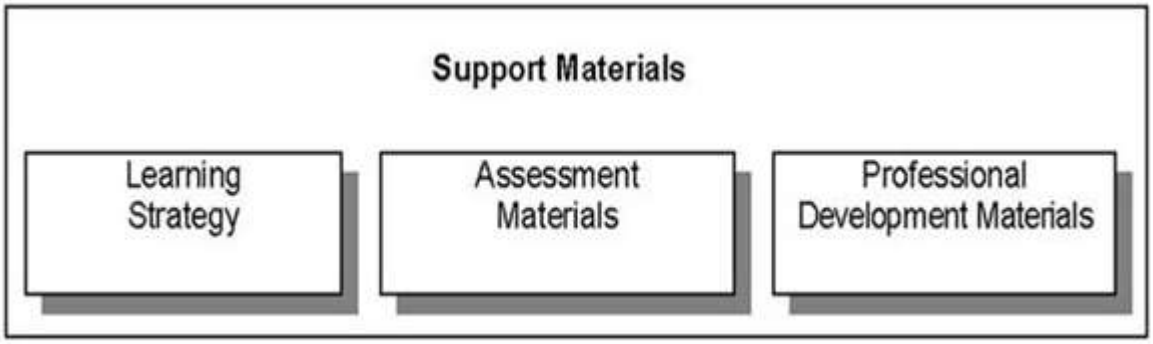
Competency Standards
Each unit of competency identifies a discrete workplace requirement and includes the knowledge and skills that underpin competency as well as language, literacy and numeracy; and occupational health and safety requirements. The units of competency must be adhered to in training and assessment to ensure consistency of outcomes.
Assessment Guidelines
The Assessment Guidelines provide an industry framework to ensure all assessments meet industry needs and nationally agreed standards as expressed in the Training Package and the AQTF 2010. The Assessment Guidelines must be followed to ensure the integrity of assessment leading to nationally recognised qualifications.
Qualifications Framework
Each Training Package provides details of those units of competency that must be achieved to award AQF qualifications. The rules around which units of competency can be combined to make up a valid AQF qualification in the Training Package are referred to as the 'packaging rules'. The packaging rules must be followed to ensure the integrity of nationally recognised qualifications issued.
Training Package Support Materials
The endorsed components of Training Packages are complemented and supported by optional support materials that provide for choice in the design of training and assessment to meet the needs of industry and learners.
Training Package support materials can relate to single or multiple units of competency, an industry sector, a qualification or the whole Training Package. They tend to fall into one or more of the categories illustrated below.



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Training Package support materials are produced by a range of stakeholders such as RTOs, individual trainers and assessors, private and commercial developers and Government agencies.

Training Package, Qualification and Unit of Competency Codes

There are agreed conventions for the national codes used for Training Packages and their components. Always use the correct codes, exactly as they appear in the Training Package, and with the code always before the title.

Training Package Codes

Each Training Package has a unique five-character national code assigned when the Training Package is endorsed, for example XYZ08. The first three characters are letters identifying the Training Package industry coverage and the last two characters are numbers identifying the year of endorsement.

Qualification Codes

Within each Training Package, each qualification has a unique eight-character code, for example UEE30111.

- the first three letters identify the Training Package
- the first number identifies the qualification level
- the next two numbers identify the position in the sequence of the qualification at that level. That is, in the case of UEE30111, it is the first AQF 3 qualification in the Training Package Note that this due to deletions and revisions this sequence may not always be complete.
- the last two numbers identify the year in which the qualification was endorsed. Where qualifications are added after the initial Training Package endorsement, the last two numbers may differ from the other Training Package qualifications as they identify the year in which those particular qualifications were endorsed.

Unit of Competency Codes

Within each Training Package, each unit of competency has a unique code. Unit of competency codes are assigned when the Training Package is endorsed, or when new units of competency are added to an existing endorsed Training Package. Unit codes are developed as follows:

- a typical code is made up of 12 characters, normally a mixture of uppercase letters and numbers, as in UEENEEH124A
- the first three characters signify the Training Package – UEE11 Electrotechnology Training Package – in the above example and up to eight characters, relating to an industry sector, function or skill area, follow;
- the last character is always a letter and identifies the unit of competency version. An ‘A’ at the end of the code indicates that this is the original unit of competency. ‘B’, or another incremented version identifier means that minor changes have been made. Typically this would mean that wording has changed in the range statement or evidence guide, providing clearer intent; and
- where changes are made that alter the outcome, a new code is assigned and the title is changed.
- In this Training Package the following approach has been adopted:

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Unit Number												
U	E	E	N	E	E	H	1	2	4	A		
Industry - E-Oz Energy Skills Australia identifier											Training Package identifier	Unit Numbers 001 to 999
12 Characters Maximum												

Training Package, Qualification and Unit of Competency Titles

There are agreed conventions for titling Training Packages and their components. Always use the correct titles, exactly as they appear in the Training Package, and with the code always placed before the title.

Training Package Titles

The title of each endorsed Training Package is unique and relates the Training Packages broad industry coverage.

Qualification Titles

The title of each endorsed Training Package qualification is unique. Qualification titles use the following sequence:

- first, the qualification is identified as either Certificate I, Certificate II, Certificate III, Certificate IV, Diploma, Advanced Diploma, Vocational Graduate Certificate, or Vocational Graduate Diploma;
- this is followed by the words ‘in’ for Certificates I to IV, and ‘of’ for Diploma, Advanced Diploma, Vocational Graduate Certificate and Vocational Graduate Diploma;
- then, the industry descriptor, for example Telecommunications; and
- then, if applicable, the occupational or functional stream in brackets, for example (Computer Systems).

For example:
UEE22111 Certificate II in Electrotechnology (Career Start).

Unit of Competency Titles

Each unit of competency title is unique. Unit of competency titles describe the competency outcome concisely, and are written in sentence case.
For example:

- UEENEED101A Use computer applications relevant to a workplace
- UEENEEE101A Apply Occupational Health Safety regulations, codes and practices in the workplace

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The Electrotechnology Industry Training Package

The Electrotechnology Training Package

This Training Package for the Electrotechnology Industry (UEE11) has been developed on behalf of the ElectroComms Industries and community stakeholders from all States/Territories of Australia by E-Oz Energy Skills Australia, with the support of the Australian National Training Authority (ANTA) and subsequently, the Department of Industry (DOI). E-Oz Energy Skills Australia operates under a charter from DOI as the declared National ElectroComms and EnergyUtilities Industry Skills Council for the ElectroComms and EnergyUtilities Industry. ElectroComms Industry practitioners, regulators, government agencies and community stakeholders contributed much effort, support and knowledge to its development.

The first Electrotechnology Training Package (UTE99) was released in 1999. At that time it broke new ground for setting nationally recognised qualifications comprised of competency standard units as they related to work performance. It assisted in benchmarking the design of training and assessment processes and practices. Since its initial release, it has undergone four version changes.

In its revised form the Electrotechnology Training Package has gone even further in improving currency and relevance to industry by enhancing the range of qualifications and competency standard units available with added flexibility for the industry. It includes an array of new and revised competency standard units, pathways and design features.

The previous competency standard units have been revamped, reorganised and updated to over 600 competency standard units across all six vocational education and training levels of the AQF. The result is a Training Package that is more relevant to the industry. It readily responds to the needs and responsibilities of the future, both in technology and work organisation.

New skilled career pathways have also been developed that suit employment-based new entrants, as well as the existing workforce or those with pre-existing skill sets.

The Training Package will be able to be used by all those involved in the delivery and assessment of competencies that cover, electronics, electrical, communications, control systems, instrumentation, lifts, refrigeration and air conditioning, renewable/sustainable energy, fire and security, gaming, rail signals and gaming. This includes:

- State training and recognition authorities who will use the Training Package as:
  - the pre-eminent industry advice to government
  - the minimum requirements to be satisfied by Registered Training Organisations in the delivery of services.

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- State/Territory Industry Training Bodies/Industry Skills Councils who will use the Training Package to inform and underpin their relationship with, and support for, the State/Territory training and recognition authorities quality systems, including providing advice.
- Registered Training Organisations who will issue qualifications/Statements of Attainment, based on the requirements outlined in the Training Package which contains the vocational standards for industry.
- Individual candidates/trainees/learners will use the provisions of the Training Package to establish their responsibilities and to protect their prerogatives.
- Organisations in mapping their human resource processes and arrangements to the National Benchmark competency standard units in the Training Package.
-

Summary of AQF Qualifications in this Training Package

Table 1 - AQF qualifications in the Electrotechnology Training Package

AQF	Code	Title
1	UEE10111	Certificate I in ElectroComms Skills
2	UEE20111	Certificate II in Split Air-conditioning and Heat Pumps Systems
2	UEE20411	Certificate II in Winding and Assembly
2	UEE20511	Certificate II in Computer Assembly and Repair
2	UEE20711	Certificate II in Data and Voice Communications
2	UEE20811	Certificate II in Electrical Wholesaling
2	UEE20911	Certificate II in Electronic Assembly
2	UEE21011	Certificate II in Fire Alarms Servicing

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2	UEE21211	Certificate II in Antennae Equipment
2	UEE21311	Certificate II in Remote Area Essential Service
2	UEE21411	Certificate II in Remote Area Power Supply Maintenance
2	UEE21611	Certificate II in Security Assembly and Set-up
2	UEE21711	Certificate II in Technical Support
2	UEE21911	Certificate II in Electronics
2	UEE22011	Certificate II in Electrotechnology (Career Start)
2	UEE22111	Certificate II in Sustainable Energy (Career Start)
3	UEE30111	Certificate III in Business Equipment
3	UEE30211	Certificate III in Computer Systems Equipment
3	UEE30311	Certificate III in Custom Electronics Installations
3	UEE30411	Certificate III in Data and Voice Communications
3	UEE30611	Certificate III in Electrical Machine Repair
3	UEE30711	Certificate III in Switchgear and Controlgear
3	UEE30811	Certificate III in Electrotechnology Electrician
3	UEE30911	Certificate III in Electronics and Communications

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3	UEE31011	Certificate III in Fire Protection Control
3	UEE31111	Certificate III in Gaming Electronics
3	UEE31211	Certificate III in Instrumentation and Control
3	UEE31411	Certificate III in Security Equipment
3	UEE31511	Certificate III in Rail – Communications and Networks
3	UEE32011	Certificate III in Renewable Energy - ELV
3	UEE32111	Certificate III in Appliance Service
3	UEE32211	Certificate III in Air-conditioning and Refrigeration
3	UEE33011	Certificate III in Electrical Fitting
4	UEE40111	Certificate IV in Computer Systems
4	UEE40211	Certificate IV in Electrical – Data and Voice Communications
4	UEE40311	Certificate IV in Installation Inspection and Audits
4	UEE40411	Certificate IV in Electrical – Instrumentation
4	UEE40511	Certificate IV in Electrical – Air-conditioning Split Systems
4	UEE40611	Certificate IV in Electrotechnology – Systems Electrician
4	UEE40711	Certificate IV in Electronics and Communications

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4	UEE40811	Certificate IV in Electrical – Fire Protection Control Systems
4	UEE40911	Certificate IV in Industrial Electronics and Control
4	UEE41011	Certificate IV in Energy Management and Control
4	UEE41111	Certificate IV in Electrical – Lift Systems
4	UEE41211	Certificate IV in Electrical – Rail Signalling
4	UEE41511	Certificate IV in Video and Audio Systems
4	UEE41611	Certificate IV in Renewable Energy
4	UEE41711	Certificate IV in Rail – Communications and Network Systems
4	UEE41911	Certificate IV in Electrical – Renewable Energy
4	UEE42011	Certificate IV in Electrical – Photovoltaic systems
4	UEE42111	Certificate IV in Electrotechnology – Electrical Contracting
4	UEE42211	Certificate IV in Instrumentation and Control
4	UEE42611	Certificate IV in Hazardous areas - Electrical
4	UEE42711	Certificate IV in Air-conditioning and Refrigeration Servicing
4	UEE42811	Certificate IV in Air-conditioning Systems Energy Management and Control

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4	UEE42911	Certificate IV in Refrigeration and Air-conditioning Systems
4	UEE43011	Certificate IV in Electrical Equipment and Systems
4	UEE43111	Certificate IV in Energy Efficiency and Assessment
4	UEE43211	Certificate IV in Industrial Automation and Control
5	UEE50111	Diploma of Computer Systems Engineering
5	UEE50211	Diploma of Electrical and Instrumentation
5	UEE50311	Diploma of Electrical and Refrigeration and Air-conditioning
5	UEE50411	Diploma of Electrical Engineering
5	UEE50511	Diploma of Electronics and Communications Engineering
5	UEE50711	Diploma of Renewable Energy Engineering
5	UEE50811	Diploma of Research and Development
5	UEE50911	Diploma of Industrial Electronics and Control Engineering
5	UEE51011	Diploma of Instrumentation and Control Engineering
5	UEE51111	Diploma of Engineering Technology - Refrigeration and Air-conditioning
5	UEE51211	Diploma of Air-conditioning and Refrigeration Engineering

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5	UEE53011	Diploma of Electrical Systems Engineering
6	UEE60211	Advanced Diploma of Electronics and Communications Engineering
6	UEE60411	Advanced Diploma of Computer Systems Engineering
6	UEE60611	Advanced Diploma of Industrial Electronics and Control Engineering
6	UEE60911	Advanced Diploma of Renewable Energy Engineering
6	UEE61111	Advanced Diploma of Automated Systems Maintenance Engineering
6	UEE61211	Advanced Diploma of Engineering – Explosion protection
6	UEE61511	Advanced Diploma of Instrumentation and Control Engineering
6	UEE61711	Advanced Diploma of Engineering Technology - Electronics
6	UEE61811	Advanced Diploma of Engineering Technology - Computer Systems
6	UEE62011	Advanced Diploma of Engineering Technology - Renewable Energy
6	UEE62111	Advanced Diploma of Engineering Technology - Electrical
6	UEE62211	Advanced Diploma of Electrical - Engineering
6	UEE62311	Advanced Diploma of Electrical Engineering – Coal Mining
6	UEE62411	Advanced Diploma of Engineering Technology - Air-conditioning and Refrigeration

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6	UEE62511	Advanced Diploma of Air-conditioning and Refrigeration Engineering
6	UEE63011	Advanced Diploma of Electrical Systems Engineering

Mapping of Qualifications

Table 2 Mapping of UEE11 Training Package Version 1 Qualifications to UEE07 Version 4 Qualifications

AQF Code	Certificate I Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE10111	Certificate I in ElectroComms Skills	UEE10110	Certificate I in ElectroComms Skills	E

AQF Code	Certificate II Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE20111	Certificate II in Split Air-conditioning and Heat Pump Systems	UEE20110	Certificate II in Split Air-conditioning and Heat Pumps Systems	E
Removed	Removed	UEE20207	Certificate II in Business Equipment Servicing	
UEE20411	Certificate II in Winding and Assembly	UEE20407	Certificate II in Winding and Assembly	E
UEE20511	Certificate II in Computer Assembly and Repair	UEE20510	Certificate II in Computer Assembly and Repair	E

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AQF Code	Certificate II Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
Removed	Removed	UEE20607	Certificate II in Custom Electronics Assembly and Setup	
UEE20711	Certificate II in Data and Voice Communications	UEE20707	Certificate II in Data and Voice Communications	E
UEE20811	Certificate II in Electrical Wholesaling	UEE20810	Certificate II in Electrical Wholesaling	E
UEE20911	Certificate II in Electronic Assembly	UEE20907	Certificate II in Electronic Assembly	E
UEE21011	Certificate II in Fire Alarms Servicing	UEE21007	Certificate II in Fire Alarms Servicing	E
Removed	Removed	UEE21107	Certificate II in Gaming Machines Servicing	
UEE21211	Certificate II in Antennae Equipment	UEE21207	Certificate II in Antennae Equipment	E
UEE21311	Certificate II in Remote Area Essential Service	UEE21310	Certificate II in Remote Area Essential Service	E
UEE21411	Certificate II in Remote Area Power Supply Maintenance	UEE21407	Certificate II in Remote Area Power Supply Maintenance	E
Removed	Removed	UEE21510	Certificate II in Renewable Energy	
UEE21611	Certificate II in Security Assembly and Setup	UEE21610	Certificate II in Security Assembly and Setup	E
UEE21711	Certificate II in Technical Support	UEE21710	Certificate II in Technical Support	E

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AQF Code	Certificate II Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE21911	Certificate II in Electronics	UEE21910	Certificate II in Electronics	E
UEE22011	Certificate II in Electrotechnology (Career Start)	UEE22010	Certificate II in Electrotechnology (Career Start)	E
UEE22111	Certificate II in Sustainable Energy (Career Start)	UEE22107	Certificate II in Sustainable Energy (Career Start)	E

AQF Code	Certificate III Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE30111	Certificate III in Business Equipment	UEE30107	Certificate III in Business Equipment	E
UEE30211	Certificate III in Computer Systems Equipment	UEE30210	Certificate III in Computer Systems Equipment	E
UEE30311	Certificate III in Custom Electronics Installations	UEE30310	Certificate III in Custom Electronics Installations	E
UEE30411	Certificate III in Data and Voice Communications	UEE30407	Certificate III in Data and Voice Communications	E
UEE30611	Certificate III in Electrical Machine Repair	UEE30607	Certificate III in Electrical Machine Repair	E
UEE30711	Certificate III in Switchgear and Control Gear	UEE30707	Certificate III in Switchgear and Control Gear	E

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AQF Code	Certificate III Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE30811	Certificate III in Electrotechnology Electrician	UEE30807	Certificate III in Electrotechnology Electrician	E
UEE30911	Certificate III in Electronics and Communications	UEE30910	Certificate III in Electronics and Communications	E
UEE31011	Certificate III in Fire Protection Control	UEE31007	Certificate III in Fire Protection Control	E
UEE31111	Certificate III in Gaming Electronics	UEE31107	Certificate III in Gaming Electronics	E
UEE31211	Certificate III in Instrumentation and Control	UEE31210	Certificate III in Instrumentation and Control	E
UEE31411	Certificate III in Security Equipment	UEE31410	Certificate III in Security Equipment	E
UEE31511	Certificate III in Rail – Communications and Networks	UEE31507	Certificate III in Rail – Communications and Networks	E
Removed	Removed	UEE31710	Certificate III in Hazardous areas – Electrician	
Removed	Removed	UEE31810	Certificate III in Hazardous areas – Instrumentation	
Removed	Removed	UEE31910	Certificate III in Explosion-protected equipment overhaul	
UEE32011	Certificate III in Renewable Energy - ELV	UEE32010	Certificate III in Renewable Energy – ELV	E
UEE32111	Certificate III in Appliance Service	UEE32110	Certificate III in Appliance Service	E

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AQF Code	Certificate III Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE32211	Certificate III in Air-conditioning and Refrigeration	UEE32210	Certificate III in Air-conditioning and Refrigeration	E
UEE33011	Certificate III in Electrical Fitting	New Qual	New Qualification	

AQF Code	Certificate IV Qualifications (UEE11 –V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE40111	Certificate IV in Computer Systems	UEE40110	Certificate IV in Computer Systems	E
UEE40211	Certificate IV in Electrical – Data and Voice Communications	UEE40210	Certificate IV in Electrical – Data and Voice Communications	E
UEE40311	Certificate IV in Electrical Installation Inspection and Audits	UEE40310	Certificate IV in Electrical Installation Inspection and Audits	E
UEE40411	Certificate IV in Electrical – Instrumentation	UEE40410	Certificate IV in Electrical – Instrumentation	E
UEE40511	Certificate IV in Electrical – Air-conditioning Split Systems	UEE40510	Certificate IV in Electrical – Air-conditioning Systems	E
UEE40611	Certificate IV in Electrotechnology – Systems Electrician	UEE40610	Certificate IV in Electrotechnology – Systems Electrician	E

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AQF Code	Certificate IV Qualifications (UEE11 –V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE40711	Certificate IV in Electronics and Communications	UEE40710	Certificate IV in Electronics and Communications	E
UEE40811	Certificate IV in Electrical – Fire Protection Control Systems	UEE40810	Certificate IV in Electrical – Fire Protection Control Systems	E
UEE40911	Certificate IV in Industrial Electronics and Control	UEE40910	Certificate IV in Industrial Electronics and Control	E
UEE41011	Certificate IV in Energy Management and Control	UEE41010	Certificate IV in Energy Management and Control	E
UEE41111	Certificate IV in Electrical – Lift Systems	UEE41110	Certificate IV in Electrical – Lift Systems	E
UEE41211	Certificate IV in Electrical – Rail Signalling	UEE41210	Certificate IV in Electrical – Rail Signalling	E
UEE41511	Certificate IV in Video and Audio Systems	UEE41510	Certificate IV in Video and Audio Systems	E
UEE41611	Certificate IV in Renewable Energy	UEE41610	Certificate IV in Renewable Energy	E
UEE41711	Certificate IV in Rail – Communications and Network Systems	UEE41710	Certificate IV in Rail – Communications and Network Systems	E
UEE41911	Certificate IV in Electrical – Renewable Energy	UEE41910	Certificate IV in Electrical – Renewable Energy	E
UEE42011	Certificate IV in Electrical – Photovoltaic Systems	UEE42010	Certificate IV in Electrical – Photovoltaic Systems	E
UEE42111	Certificate IV in Electrotechnology – Electrical Contracting	UEE42110	Certificate IV in Electrotechnology – Electrical Contracting	E

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AQF Code	Certificate IV Qualifications (UEE11 –V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE42211	Certificate IV in Instrumentation and Control	UEE42210	Certificate IV in Instrumentation and Control	E
Removed	Removed	UEE42410	Certificate IV in Hazardous areas – Industrial control	
UEE42611	Certificate IV in Hazardous areas – Electrical	UEE42610	Certificate IV in Hazardous areas – Electrical	E
UEE42711	Certificate IV in Air-conditioning and Refrigeration Servicing	UEE42710	Certificate IV in Air-conditioning and Refrigeration Servicing	E
UEE42811	Certificate IV in Air-conditioning Systems Energy Management and Control	UEE42810	Certificate IV in Air-conditioning Systems Energy Management and Control	E
UEE42911	Certificate IV in Refrigeration and Air-conditioning Systems	UEE42910	Certificate IV in Refrigeration and Air-conditioning Systems	E
UEE43011	Certificate IV in Electrical Equipment and Systems	New Qual	New Qualification	
UEE43111	Certificate IV in Energy Efficiency and Assessment	New Qual	New Qualification	
UEE43211	Certificate IV in Industrial Automation and Control	New Qual	New Qualification	

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AQF Code	Diploma Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE50111	Diploma of Computer Systems Engineering	UEE50110	Diploma of Computer Systems Engineering	E
UEE50211	Diploma of Electrical and Instrumentation	UEE50210	Diploma of Electrical and Instrumentation	E
UEE50311	Diploma of Electrical and Refrigeration and Air-conditioning	UEE50310	Diploma of Electrical and Refrigeration and Air-conditioning	E
UEE50411	Diploma of Electrical Engineering	UEE50410	Diploma of Electrical Engineering	E
UEE50511	Diploma of Electronics and Communications Engineering	UEE50510	Diploma of Electronics and Communications Engineering	E
UEE50711	Diploma of Renewable Energy Engineering	UEE50710	Diploma of Renewable Energy Engineering	E
UEE50811	Diploma of Research and Development	UEE50810	Diploma of Research and Development	E
UEE50911	Diploma of Industrial Electronics and Control Engineering	UEE50910	Diploma of Industrial Electronics and Control Engineering	E
UEE51011	Diploma of Instrumentation and Control Engineering	UEE51010	Diploma of Instrumentation and Control Engineering	E
UEE51111	Diploma of Engineering Technology - Refrigeration and Air-conditioning	UEE51110	Diploma of Engineering Technology - Refrigeration and Air-conditioning	E
UEE51211	Diploma of Air-conditioning and Refrigeration Engineering	UEE51210	Diploma of Air-conditioning and Refrigeration Engineering	E

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AQF Code	Diploma Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE53011	Diploma of Electrical Systems Engineering	New Qual	New Qualification	

AQF Code	Advanced Diploma Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE60211	Advanced Diploma of Electronics and Communications Engineering	UEE60210	Advanced Diploma of Electronics and Communications Engineering	E
UEE60411	Advanced Diploma of Computer Systems Engineering	UEE60410	Advanced Diploma of Computer Systems Engineering	E
UEE60611	Advanced Diploma of Industrial Electronics and Control Engineering	UEE60610	Advanced Diploma of Industrial Electronics and Control Engineering	E
UEE60911	Advanced Diploma of Renewable Energy Engineering	UEE60910	Advanced Diploma of Renewable Energy Engineering	E
UEE61111	Advanced Diploma of Automated Systems Maintenance Engineering	UEE61110	Advanced Diploma of Automated Systems Maintenance Engineering	E
UEE61211	Advanced Diploma of Engineering Explosion protection	UEE61210	Advanced Diploma of Engineering Explosion protection	E
Removed	Removed	UEE61410	Advanced Diploma of Engineering – Explosion	

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AQF Code	Advanced Diploma Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
			protection - Industrial control	
UEE61511	Advanced Diploma of Instrumentation and Control Engineering	UEE61510	Advanced Diploma of Instrumentation and Control Engineering	E
UEE61711	Advanced Diploma of Engineering Technology - Electronic	UEE61710	Advanced Diploma of Engineering Technology - Electronic	E
UEE61811	Advanced Diploma of Engineering Technology - Computer Systems	UEE61810	Advanced Diploma of Engineering Technology - Computer Systems	E
UEE62011	Advanced Diploma of Engineering Technology - Renewable Energy	UEE62010	Advanced Diploma of Engineering Technology - Renewable Energy	E
UEE62111	Advanced Diploma of Engineering Technology – Electrical	UEE62110	Advanced Diploma of Engineering Technology – Electrical	E
UEE62211	Advanced Diploma of Electrical – Engineering	UEE62210	Advanced Diploma of Electrical – Engineering	E
UEE62311	Advanced Diploma of Electrical Engineering – Coal Mining	UEE62310	Advanced Diploma of Electrical Engineering – Coal Mining	E
UEE62411	Advanced Diploma of Engineering Technology – Air-conditioning and Refrigeration	UEE62410	Advanced Diploma of Engineering Technology – Air-conditioning and Refrigeration	E
UEE62511	Advanced Diploma of Air-conditioning and Refrigeration Engineering	UEE62510	Advanced Diploma of Air-conditioning and Refrigeration Engineering	E

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AQF Code	Advanced Diploma Qualifications (UEE11 – V1)	AQF Code	Training Package (UEE07 – V4)	E = Equivalent N = Not Equivalent
UEE63011	Advanced Diploma of Electrical Systems Engineering	New Qual	New Qualification	

Table 3 Mapping of UEE07 Training Package Version 4 Qualifications to UEE07 Version 3.1 Qualifications

AQF Code	Certificate II Qualifications (UEE07 – V4)	Training Package (UEE07 – V3.1)	E = Equivalent N = Not Equivalent
UEE20111	Certificate II in Split Air-conditioning and Heat Pumps Systems	Certificate II in Air-conditioning Split Systems	E except for the addition of heat pump systems
	Removed	Certificate II in Appliance Servicing – Refrigerants	

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AQF Code	Certificate III Qualifications (UEE07 – V4)	Training Package (UEE07 – V3.1)	E = Equivalent N = Not Equivalent
UEE32111	Certificate III in Appliance Service	Certificate III in Appliance Servicing	E
UEE32211	Certificate III in Air-conditioning and Refrigeration	Certificate III in Refrigeration and Air-conditioning	E

AQF Code	Certificate IV Qualifications (UEE07 –V4)	Training Package (UEE07 – V3.1)	E = Equivalent N = Not Equivalent
UEE42711	Certificate IV in Air-conditioning and Refrigeration Servicing	Certificate IV in Refrigeration and Air-conditioning Servicing	E
UEE42811	Certificate IV in Air-conditioning Systems Energy Management and Control	Certificate IV in Air-conditioning Energy Management and Control	E
UEE42911	Certificate IV in Refrigeration and Air-conditioning Systems	Certificate IV in Air-conditioning and Refrigeration Systems	E

AQF Code	Diploma Qualifications (UEE07 – V4)	Training Package (UEE07 – V3.1)	E = Equivalent N = Not Equivalent
UEE51111	Diploma of Engineering Technology – Refrigeration and	New Qualification	

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AQF Code	Diploma Qualifications (UEE07 – V4)	Training Package (UEE07 – V3.1)	E = Equivalent N = Not Equivalent
	Air-conditioning		
UEE51211	Diploma of Air-conditioning and Refrigeration Engineering	Diploma of Refrigeration and Air-conditioning Engineering	E

AQF Code	Advanced Diploma Qualifications (UEE07 – V4)	Training Package (UEE07 – V3.1)	E = Equivalent N = Not Equivalent
UEE62211	Advanced Diploma of Electrical - Engineering	Advanced Diploma of Electrical Engineering	N
UEE62311	Advanced Diploma of Electrical Engineering – Coal Mining	New Qualification	
UEE62411	Advanced Diploma of Engineering Technology – Air-conditioning and Refrigeration	Advanced Diploma of Engineering Technology - Refrigeration and Air-conditioning	E
UEE62511	Advanced Diploma of Air-conditioning and Refrigeration Engineering	Advanced Diploma of Refrigeration and Air-conditioning Engineering	N

Table 4 Mapping of UEE07 Training Package Version 3.1 Qualifications to UEE07 Version 3.0 Qualifications

Detailed below is a summary qualifications mapping of the Version 3.1 Electrotechnology Training Package (UEE07) to the version 3.0 Electrotechnology Training Package (UEE07). This table maps only the Qualifications which have changed between these versions.

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AQF Code	Certificate I Qualifications (UEE07 – V3.1)	Training Package (UEE07 – V3.0)	E = Equivalent N = Not Equivalent
UEE10110	Certificate I in ElectroComms Skills	UEE10110 Certificate I in ElectroComms Skills	E

AQF Code	Certificate II Qualifications (UEE07 – V3.1)	Training Package (UEE07 – V3.0)	E = Equivalent N = Not Equivalent
UEE20510	Certificate II in Computer Assembly and Repair	UEE20507 Certificate II in Computer Assembly and Repair	E
UEE21310	Certificate II in Remote Area Essential Service	UEE21310 Certificate II in Remote Area Essential Service	E
UEE21610	Certificate II in Security Assembly and Setup	UEE21610 Certificate II in Security Assembly and Setup	E
UEE21710	Certificate II in Technical Support	UEE21710 Certificate II in Technical Support	E
UEE21910	Certificate II in Electronics	UEE21907 Certificate II in Electronics	E
UEE22010	Certificate II in Electrotechnology (Career Start)	UEE22010 Certificate II in Electrotechnology (Career Start)	E

AQF Code	Certificate III Qualifications (UEE07 – V3.1)	Training Package (UEE07 – V3.0)	E = Equivalent N = Not Equivalent
UEE30210	Certificate III in Computer Systems Equipment	UEE30207 Certificate III in Computer Systems Equipment	E
UEE30310	Certificate III in Custom Electronics Installations	UEE30310 Certificate III in Custom Electronics Installations	E

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AQF Code	Certificate III Qualifications (UEE07 – V3.1)	Training Package (UEE07 – V3.0)	E = Equivalent N = Not Equivalent
UEE30910	Certificate III in Electronics and Communications	UEE30910 Certificate III in Electronics and Communications	E

AQF Code	Certificate IV Qualifications (UEE07 –V3.1)	Training Package (UEE07 – V3.0)	E = Equivalent N = Not Equivalent
UEE40110	Certificate IV in Computer Systems	UEE40110 Certificate IV in Computer Systems	E
UEE40710	Certificate IV in Electronics and Communications	UEE40710 Certificate IV in Electronics and Communications	E
UEE41510	Certificate IV in Video and Audio Systems	UEE41507 Certificate IV in Video and Audio Systems	E
UEE41610	Certificate IV in Renewable Energy	UEE41610 Certificate IV in Renewable Energy	E

AQF Code	Diploma Qualifications (UEE07 – V3.1)	Training Package (UEE07 – V3.0)	E = Equivalent N = Not Equivalent
UEE50110	Diploma of Computer Systems Engineering	UEE50110 Diploma of Computer Systems Engineering	E
UEE50510	Diploma of Electronics and Communications	UEE50510 Diploma of Electronics and Communications	E

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AQF Code	Diploma Qualifications (UEE07 – V3.1)	Training Package (UEE07 – V3.0)	E = Equivalent N = Not Equivalent
	Engineering	Engineering	

AQF Code	Advanced Diploma Qualifications (UEE07 – V3.1)	Training Package (UEE07 – V3.0)	E = Equivalent N = Not Equivalent
UEE60210	Advanced Diploma of Electronics and Communications Engineering	UEE60210 Advanced Diploma of Electronics and Communications Engineering	E
UEE60410	Advanced Diploma of Computer Systems Engineering	UEE60407 Advanced Diploma of Computer Systems Engineering	E
UEE62010	Advanced Diploma of Engineering Technology - Renewable Energy	UEE61007 Advanced Diploma of Renewable Energy – Technology	E
UEE62110	Advanced Diploma of Engineering Technology - Electrical	UEE61307 Advanced Diploma of Electrical – Technology	E

Table 5 Mapping of UEE07 Training Package Version 3 Qualifications to UEE07 Version 2 Qualifications

Detailed below is a summary qualifications mapping of the Version 3 Electrotechnology Training Package (UEE07) to the version 2 Electrotechnology Training Package (UEE07). This table maps only the Qualifications which have changed between these versions.

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AQF Code	Certificate I Qualifications (UEE07 – V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
UEE10110	Certificate I in ElectroComms Skills	UEE10107 Certificate I in ElectroComms Skills	E

AQF Code	Certificate II Qualifications (UEE07 – V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
UEE20810	Certificate II in Electrical Wholesaling	New Qualification	
UEE21310	Certificate II in Remote Area Essential Service	UEE21307 Certificate II in Remote Area Essential Service	N
UEE21510	Certificate II in Renewable Energy	UEE21507 Certificate II in Renewable Energy	E
UEE21610	Certificate II in Security Assembly and Setup	UEE21607 Certificate II in Security Assembly and Setup	E
UEE21810	Certificate II in Appliance Servicing – Refrigerants	UEE21807 Certificate II in Appliance Servicing – Refrigerants	E
UEE22010	Certificate II in Electrotechnology (Career Start)	UEE22007 Certificate II in Electrotechnology (Career Start)	E

AQF Code	Certificate III Qualifications (UEE07 – V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent

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AQF Code	Certificate III Qualifications (UEE07 – V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
UEE30310	Certificate III in Custom Electronics Installations	UEE30307 Certificate III in Custom Electronics Installations	E
UEE30510	Certificate III in Appliance Servicing	UEE30507 Certificate III in Appliance Servicing	E
UEE30910	Certificate III in Electronics and Communications	UEE30907 Certificate III in Electronics and Communications	E
UEE31210	Certificate III in Instrumentation and Control	UEE31207 Certificate III in Instrumentation and Control	N
UEE31410	Certificate III in Security Equipment	UEE31407 Certificate III in Security Equipment	E
UEE31710	Certificate III in Hazardous areas – Electrician	UEE31707 Certificate III in Hazardous areas – Electrician	E
UEE31810	Certificate III in Hazardous areas – Instrumentation	UEE31807 Certificate III in Hazardous areas – Instrumentation	N
UEE31910	Certificate III in Explosion-protected equipment overhaul	UEE31907 Certificate III in Explosion-protected equipment overhaul	E
UEE32010	Certificate III in Renewable Energy - ELV	UEE32007 Certificate III in Renewable Energy – ELV	E

AQF Code	Certificate IV Qualifications (UEE07 –V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent

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AQF Code	Certificate IV Qualifications (UEE07 –V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
UEE40110	Certificate IV in Computer Systems	UEE40107 Certificate IV in Computer Systems	E
UEE40210	Certificate IV in Electrical – Data and Voice Communications	UEE40207 Certificate IV in Electrical – Data and Voice Communications	E
UEE40310	Certificate IV in Electrical Installation Inspection and Audits	UEE40307 Certificate IV in Electrical Installation Inspection and Audits	E
UEE40410	Certificate IV in Electrical – Instrumentation	UEE40407 Certificate IV in Electrical – Instrumentation	E
UEE40510	Certificate IV in Electrical – Air-conditioning Systems	UEE40507 Certificate IV in Electrical – Air-conditioning Systems	E
UEE40610	Certificate IV in Electrotechnology – Systems Electrician	UEE40607 Certificate IV in Electrotechnology – Systems Electrician	E
UEE40710	Certificate IV in Electronics and Communications	UEE40707 Certificate IV in Electronics and Communications	E
UEE40810	Certificate IV in Electrical – Fire Protection Control Systems	UEE40807 Certificate IV in Electrical – Fire Protection Control Systems	E
UEE40910	Certificate IV in Industrial Electronics and Control	UEE40907 Certificate IV in Industrial Electronics and Control – Option 1 only	E
UEE41010	Certificate IV in Energy Management and Control	UEE41007 Certificate IV in Energy Management and	E

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AQF Code	Certificate IV Qualifications (UEE07 –V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
		Control – Option 2 only	
UEE41110	Certificate IV in Electrical – Lift Systems	UEE41107 Certificate IV in Electrical – Lift Systems	E
UEE41210	Certificate IV in Electrical – Rail Signalling	UEE41207 Certificate IV in Electrical – Rail Signalling	E
UEE41310	Certificate IV in Refrigeration and Air-conditioning Servicing	UEE41307 Certificate IV in Refrigeration and Air-conditioning Servicing	E
UEE41510	Certificate IV in Video and Audio Systems	UEE41507 Certificate IV in Video and Audio Systems	E
UEE41610	Certificate IV in Renewable Energy	UEE41607 Certificate IV in Renewable Energy	E
UEE41710	Certificate IV in Rail – Communications and Network Systems	UEE41707 Certificate IV in Rail – Communications and Network Systems	E
UEE41910	Certificate IV in Electrical – Renewable Energy	UEE41907 Certificate IV in Electrical – Renewable Energy	E
UEE42010	Certificate IV in Electrical – Photovoltaic Systems	UEE42009 Certificate IV in Electrical – Photovoltaic Systems	E
UEE42110	Certificate IV in Electrotechnology – Electrical Contracting	New Qualification	
UEE42210	Certificate IV in Instrumentation and Control	UEE40907 Certificate IV in Industrial Electronics and Control – Option 2 only	N

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AQF Code	Certificate IV Qualifications (UEE07 –V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
UEE42310	Certificate IV in Air-conditioning Energy Management and Control	UEE41007 Certificate IV in Energy Management and Control – Option 1 only	E
UEE42410	Certificate IV in Hazardous areas – Industrial control	UEE41807 Certificate IV in Hazardous areas – Option 2 only	N
UEE42510	Certificate IV in Air-conditioning and Refrigeration Systems	UEE41407 Certificate IV in Refrigeration and Air-conditioning Systems	E
UEE42610	Certificate IV in Hazardous areas - Electrical	UEE41807 Certificate IV in Hazardous areas – Option 1 only	E

AQF Code	Diploma Qualifications (UEE07 – V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
UEE50110	Diploma of Computer Systems Engineering	UEE50107 Diploma of Computer Systems Engineering	E
UEE50210	Diploma of Electrical and Instrumentation	UEE50207 Diploma of Electrical and Instrumentation	E
UEE50310	Diploma of Electrical and Refrigeration and Air-conditioning	UEE50307 Diploma of Electrical and Refrigeration and Air-conditioning	E
UEE50410	Diploma of Electrical Engineering	UEE50407 Diploma in Electrical Engineering	E

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AQF Code	Diploma Qualifications (UEE07 – V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
UEE50510	Diploma of Electronics and Communications Engineering	UEE50507 Diploma of Electronics and Communications Engineering	E
UEE50610	Diploma of Refrigeration and Air-conditioning Engineering	UEE50607 Diploma of Refrigeration and Air-conditioning Engineering	E
UEE50710	Diploma of Renewable Energy Engineering	UEE50707 Diploma of Renewable Energy Engineering	E
UEE50810	Diploma of Research and Development	UEE50807 Diploma of Research and Development	E
UEE50910	Diploma of Industrial Electronics and Control Engineering	UEE50907 Diploma of Industrial Electronics and Control Engineering – Option 1 only	E
UEE51010	Diploma in Instrumentation and Control Engineering	UEE50907 Diploma of Industrial Electronics and Control Engineering – Option 2 only	N

AQF Code	Advanced Diploma Qualifications (UEE07 – V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
UEE60110	Advanced Diploma of Electrical Engineering	UEE60107 Advanced Diploma in Electrical Engineering	E
UEE60210	Advanced Diploma of Electronics and Communications Engineering	UEE60207 Advanced Diploma of Electronics and Communications Engineering	E

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AQF Code	Advanced Diploma Qualifications (UEE07 – V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
UEE60410	Advanced Diploma of Computer Systems Engineering	UEE60407 Advanced Diploma of Computer Systems Engineering	E
UEE60610	Advanced Diploma of Industrial Electronics and Control Engineering	UEE60607 Advanced Diploma of Industrial Electronics and Control Engineering – Option 1 only	E
UEE60710	Advanced Diploma of Refrigeration and Air-conditioning Engineering	UEE60707 Advanced Diploma of Refrigeration and Air-conditioning Engineering	E
UEE60910	Advanced Diploma of Renewable Energy Engineering	UEE60907 Advanced Diploma of Renewable Energy Engineering	E
UEE61110	Advanced Diploma of Automated Systems Maintenance Engineering	UEE61107 Advanced Diploma of Automated Systems Maintenance Engineering	E
UEE61210	Advanced Diploma of Engineering – Explosion protection	UEE61207 Advanced Diploma of Engineering – Explosion protection	E
UEE61410	Advanced Diploma of Engineering Explosion protection – Industrial control	UEE61207 Advanced Diploma of Engineering – Explosion protection – Option 2 only	N
UEE61510	Advanced Diploma of Instrumentation and Control Engineering	UEE60607 Advanced Diploma of Industrial Electronics and Control Engineering	N

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AQF Code	Advanced Diploma Qualifications (UEE07 – V3)	Training Package (UEE07 – V2)	E = Equivalent N = Not Equivalent
		– Option 2 only	
UEE61710	Advanced Diploma of Engineering Technology - Electronic	UEE60307 Advanced Diploma of Electronic –Technology	E
UEE61810	Advanced Diploma of Engineering Technology - Computer Systems	UEE60507 Advanced Diploma of Computer Systems – Technology	E
UEE61910	Advanced Diploma of Engineering Technology - Refrigeration and Air-conditioning	New Qualification	
UEE62010	Advanced Diploma of Engineering Technology - Renewable Energy	UEE61007 Advanced Diploma of Renewable Energy – Technology	E
UEE62110	Advanced Diploma of Engineering Technology - Electrical	UEE61307 Advanced Diploma of Electrical – Technology	E

Table 6 Mapping of UEE07 Training Package Version 2 Qualifications to UEE07 Version 1 Qualifications

AQF Code	Qualifications in UEE07 version 2	Nature of Relationship to Previous UEE07 Version 1 Training Package	Equivalent – full, part, or no
	All Existing Qualifications in UEE07 Version 1	All existing qualifications in UEE07 version 1 remain unchanged	Refer to table mapping UEE07 Version 1 qualifications to UEE06 Version 1 for equivalences

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AQF Code	Qualifications in UEE07 version 2	Nature of Relationship to Previous UEE07 Version 1 Training Package	Equivalent – full, part, or no
UEE42009	Certificate IV in Electrical - Photovoltaic Systems New Qualification	Qualification designed to meet industry, regulatory and Clean Energy Council accreditation requirements for the design and/or installation of grid connected solar systems on domestic and commercial premises.	New

Table 7 Mapping of UEE07 Training Package Version 1 Qualifications to UEE06 Qualifications

Detailed below is a summary qualifications mapping of the former Electrotechnology Training Package (UEE06) to the new Electrotechnology Training Package (UEE07).

AQF Code	Certificate I Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE10107	Certificate I in ElectroComms Skills	UEE10106 Certificate I in ElectroComms Skills	Full

AQF Code	Certificate II Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE20107	Certificate II in Air-conditioning Split Systems	UEE20106 Certificate II in Air-conditioning Split Systems	Full

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AQF Code	Certificate II Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE20207	Certificate II in Business Equipment Servicing	UEE20206 Certificate II in Business Equipment Servicing	Full
Reserved	Certificate II in Electrotechnology Business Support	Certificate II in Electrotechnology Business Support UTE20199	
UEE20407	Certificate II in Winding and Assembly	UEE20406 Certificate II in Winding and Assembly	Full
UEE20507	Certificate II in Computer Assembly and Repair	UEE20506 Certificate II in Computer Assembly and Repair	Part – All Pre-requisites removed from UEENEED002B
UEE20607	Certificate II in Custom Electronics Assembly and Setup	UEE20606 Certificate II in Custom Electronics Assembly and Setup	Full
UEE20707	Certificate II in Data and Voice Communications	UEE20706 Certificate II in Data and Voice Communications	Full
Reserved	Certificate II in Electrical Wholesaling		
UEE20907	Certificate II in Electronic Assembly	UEE20906 Certificate II in Electronic Assembly	Part – Removal of Pre-requisites from UEENEEH002B
UEE21007	Certificate II in Fire Alarms Servicing	UEE21006 Certificate II in Fire Alarms Servicing	Full
UEE21107	Certificate II in Gaming Machines	UEE21106 Certificate II in Gaming Machines	Full

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AQF Code	Certificate II Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
	Servicing	Servicing	
UEE21207	Certificate II in Antennae Equipment	UEE21206 Certificate II in Antennae Equipment	Full
UEE21307	Certificate II in Remote Area Essential Service	UEE21306 Certificate II in Remote Area Essential Service	Full
UEE21407	Certificate II in Remote Area Power Supply Maintenance	UEE21406 Certificate II in Remote Area Power Supply Maintenance	Full
UEE21507	Certificate II in Renewable Energy	UEE21506 Certificate II in Renewable Energy	Part – Removal of UEENEEK025B from Core.
UEE21607	Certificate II in Security Assembly and Setup	UEE21606 Certificate II in Security Assembly and Setup	Full
UEE21707	Certificate II in Technical Support	UEE21706 Certificate II in Technical Support	Part – All Pre-requisites removed from UEENEEE022B
UEE21807	Certificate II in Appliance Servicing – Refrigerants	UEE21806 Certificate II in Appliance Servicing – Refrigerants	Full
UEE21907	Certificate II in Electronics	UEE21906 Certificate II in Electronics	Part – Removal of Pre-requisites from UEENEEH002B
UEE22007	Certificate II in Electrotechnology (Career Start)	UEE22000 Certificate II in Electrotechnology (Career Start)	Full

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AQF Code	Certificate II Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE22107	Certificate II in Sustainable Energy (Career Start)	UEE22106 Certificate II in Sustainable Energy (Career Start)	Full

AQF Code	Certificate III Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE30107	Certificate III in Business Equipment	UEE30106 Certificate III in Business Equipment	Part – Removal of Pre-requisites from UEENEEH002B and UEENEEH011B and UEENEEH012B and UEENEEH013B and UEENEEH039B and Inclusion of ‘or UEENEEH069B’ in UEENEEH014B Pre-requisite statement
UEE30207	Certificate III in Computer Systems Equipment	UEE30206 Certificate III in Computer Systems Equipment	Part – All Pre-requisites removed from UEENEED002B
UEE30307	Certificate III in Custom Electronics Installations	UEE30306 Certificate III in Custom Electronics Installations	Part - Inclusion of ‘or UEENEEH069B’ in UEENEEH014B Pre-requisite statement
UEE30407	Certificate III in Data and Voice Communications	UEE30406 Certificate III in Data and Voice Communications	Part - Inclusion of ‘or UEENEEH069B’ in UEENEEH014B Pre-requisite statement
UEE30507	Certificate III in Appliance Servicing	UEE30506 Certificate III in Appliance Servicing	Part – Removal of Pre-requisite from UEENEEJ054B and amendment of EKAS alignments in UEENEEP001B

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AQF Code	Certificate III Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE30607	Certificate III in Electrical Machine Repair	UEE30606 Certificate III in Electrical Machine Repair	Part – All Pre-requisites removed from UEENEEG001B and UEENEEG002B and amendment of EKAS alignments in UEENEEP001B
UEE30707	Certificate III in Switchgear and Control Gear	UEE30706 Certificate III in Switchgear and Control Gear	Part – All Pre-requisites removed from UEENEEG001B and UEENEEG002B and amendment of EKAS alignments in UEENEEP001B
UEE30807	Certificate III in Electrotechnology Electrician	UEE30806 Certificate III in Electrotechnology Electrician	Part – All Pre-requisites removed from UEENEEG001B and UEENEEG002B
UEE30907	Certificate III in Electronics and Communications	UEE30906 Certificate III in Electronics and Communications	Part – Removal of Pre-requisites from UEENEEH002B and UEENEEH011B and UEENEEH012B and UEENEEH013B and UEENEEH039B and Inclusion of ‘or UEENEEH069B’ in UEENEEH014B Pre-requisite statement
UEE31007	Certificate III in Fire Protection Control	UEE31006 Certificate III in Fire Protection Control	Part - Inclusion of ‘or UEENEEH069B’ in UEENEEH014B Pre-requisite statement
UEE31107	Certificate III in Gaming Electronics	UEE31106 Certificate III in Gaming Electronics	Part – Removal of Pre-requisites from UEENEEH002B and UEENEEH011B and UEENEEH012B and UEENEEH013B and UEENEEH018B and UEENEEH039B and Inclusion of ‘or UEENEEH069B’ in UEENEEH014B

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AQF Code	Certificate III Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
			Pre-requisite statement
UEE31207	Certificate III in Instrumentation and Control	UEE31206 Certificate III in Instrumentation and Control	Part - Inclusion of 'or UEENEEH069B' in UEENEEH014B Pre-requisite statement
UEE31307	Certificate III in Refrigeration and Air-conditioning	UEE31306 Certificate III in Refrigeration and Air-conditioning	Part – All Pre-requisite units removed from unit UEENEEC025B and amendment of EKAS alignments in UEENEEP001B
UEE31407	Certificate III in Security Equipment	UEE31406 Certificate III in Security Equipment	Part - Inclusion of 'or UEENEEH069B' in UEENEEH014B Pre-requisite statement
UEE31507	Certificate III in Rail – Communications and Networks	UEE31506 Certificate III in Rail – Communications and Networks	Part – Removal of Pre-requisites from UEENEEH002B and UEENEEH011B and UEENEEH012B and UEENEEH013B and UEENEEH039B and Inclusion of 'or UEENEEH069B' in UEENEEH014B Pre-requisite statement
Reserved	Certificate III in Wireless Communications	Certificate III in Wireless Communications	
UEE31707	Certificate III in Hazardous areas – Electrician	UEE31706 Certificate III in Hazardous areas – Electrician	Part – All Pre-requisites removed from UEENEEG001B and UEENEEG002B and amendment of Pre-requisite statement in UEENEEM001B
UEE31807	Certificate III in Hazardous	UEE31806 Certificate III in	Part - Inclusion of 'or UEENEEH069B' in UEENEEH014B

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AQF Code	Certificate III Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
	areas – Instrumentation	Hazardous areas – Instrumentation	Pre-requisite statement and amendment of Pre-requisite statement in UEENEEM001B
UEE31907	Certificate III in Explosion-protected equipment overhaul	UEE31906 Certificate III in Explosion-protected equipment overhaul	Part – All Pre-requisites removed from UEENEEG001B and UEENEEG002B and amendment of Pre-requisite statement in UEENEEM007B
UEE32007	Certificate III in Renewable Energy - ELV	New	No

AQF Code	Certificate IV Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE40107	Certificate IV in Computer Systems	UEE40106 Certificate IV in Computer Systems	Part – All Pre-requisites removed from UEENEED002B
UEE40207	Certificate IV in Electrical – Data and Voice Communications	UEE40206 Certificate IV in Electrical – Data and Voice Communications	Full
UEE40307	Certificate IV in Electrical Installation Inspection and Audits	UEE40306 Certificate IV in Electrical Installation Inspection and Audits	Full
UEE40407	Certificate IV in Electrical – Instrumentation	UEE40406 Certificate IV in Electrical – Instrumentation	Full
UEE40507	Certificate IV in Electrical –	UEE40506 Certificate IV in Electrical –	Full

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AQF Code	Certificate IV Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
	Air-conditioning Systems	Air-conditioning Systems	
UEE40607	Certificate IV in Electrotechnology – Systems Electrician	UEE40606 Certificate IV in Electrotechnology – Systems Electrician	Full
UEE40707	Certificate IV in Electronics and Communications	UEE40706 Certificate IV in Electronics and Communications	Part – Removal of Pre-requisites from UEENEEH002B and UEENEEH011B and UEENEEH012B and UEENEEH013B and UEENEEH039B and Inclusion of 'or UEENEEH069B' in UEENEEH014B Pre-requisite statement
UEE40807	Certificate IV in Electrical – Fire Protection Control Systems	UEE40806 Certificate IV in Electrical – Fire Protection Control Systems	Full
UEE40907	Certificate IV in Industrial Electronics and Control	UEE40906 Certificate IV in Industrial Electronics and Control	Part – Removal of Pre-requisites from UEENEEH043B and UEENEEH044B
UEE41007	Certificate IV in Energy Management and Control	UEE41006 Certificate IV in Energy Management and Control	Full
UEE41107	Certificate IV in Electrical – Lift Systems	UEE41106 Certificate IV in Electrical – Lift Systems	Part – Removal of Pre-requisites from UEENEEH043B and UEENEEH044B
UEE41207	Certificate IV in Electrical – Rail Signalling	UEE41206 Certificate IV in Electrical – Rail Signalling	Full

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AQF Code	Certificate IV Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE41307	Certificate IV in Refrigeration and Air-conditioning Servicing	UEE41306 Certificate IV in Refrigeration and Air-conditioning Servicing	Full
UEE41407	Certificate IV in Refrigeration and Air-conditioning Systems	UEE41406 Certificate IV in Refrigeration and Air-conditioning Systems	Full
UEE41507	Certificate IV in Video and Audio Systems	UEE415076 Certificate IV in Video and Audio Systems	Part – Removal of Pre-requisites from UEENEEH002B and UEENEEH011B and UEENEEH012B and UEENEEH013B and UEENEEH039B and Inclusion of 'or UEENEEH069B' in UEENEEH014B Pre-requisite statement
UEE41607	Certificate IV in Renewable Energy	UEE41606 Certificate IV in Renewable Energy	Part – All Pre-requisites removed from UEENEEG002B
UEE41707	Certificate IV in Rail – Communications and Network Systems	UEE41706 Certificate IV in Rail – Communications and Network Systems	Part – Removal of Pre-requisites from UEENEEH002B and UEENEEH011B and UEENEEH012B and UEENEEH013B and UEENEEH039B and Inclusion of 'or UEENEEH069B' in UEENEEH014B Pre-requisite statement
UEE41807	Certificate IV in Hazardous areas	UEE41806 Certificate IV in Hazardous areas	Part – amendment of Pre-requisite statement in UEENEEEM004A

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AQF Code	Certificate IV Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE41907	Certificate IV in Electrical – Renewable Energy	New	No

AQF Code	Diploma Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE50107	Diploma of Computer Systems Engineering	UEE50106 Diploma in Computer Systems Engineering	Full
UEE50207	Diploma of Electrical and Instrumentation	UEE50206 Diploma of Electrical and Instrumentation	Full
UEE50307	Diploma of Electrical and Refrigeration and Air-conditioning	UEE50306 Diploma of Electrical and Refrigeration and Air-conditioning	Full
UEE50407	Diploma of Electrical Engineering	UEE50406 Diploma in Electrical Engineering	Full
UEE50507	Diploma of Electronics and Communications Engineering	UEE50506 Diploma of Electronics and Communications Engineering	Full
UEE50607	Diploma of Refrigeration and Air-conditioning Engineering	UEE50606 Diploma of Refrigeration and Air-conditioning Engineering	Full
UEE50707	Diploma of Renewable Energy	UEE50706 Diploma of Renewable Energy	Full

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AQF Code	Diploma Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
	Engineering	Engineering	
UEE50807	Diploma of Research and Development	UEE50806 Diploma of Research and Development	Full
UEE50907	Diploma of Industrial Electronics and Control Engineering	UEE50906 Diploma of Industrial Electronics and Control Engineering	Part – Removal of Pre-requisites from UEENEEH043B and UEENEEH044B

AQF Code	Advanced Diploma Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE60107	Advanced Diploma of Electrical Engineering	Advanced Diploma in Electrical Engineering	Full
UEE60207	Advanced Diploma of Electronics and Communications Engineering	UEE60206 Advanced Diploma of Electronics and Communications Engineering	Full
UEE60307	Advanced Diploma of Electronic – Technology	UEE60306 Advanced Diploma of Electronic – Technology	Part – Pre-requisites removed from UEENEED002B and UEENEEE025B, and UEENEEH011B and UEENEEH012B and UEENEEH039B
UEE60407	Advanced Diploma of Computer Systems Engineering	UEE60406 Advanced Diploma of Computer Systems Engineering	Part – All Pre-requisites removed from UEENEED052B

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AQF Code	Advanced Diploma Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
UEE60507	Advanced Diploma of Computer Systems – Technology	UEE60506 Advanced Diploma of Computer Systems – Technology	Part –Pre-requisites removed from UEENEED002B and UEENEEH012B
UEE60607	Advanced Diploma of Industrial Electronics and Control Engineering	UEE60606 Advanced Diploma of Industrial Electronics and Control Engineering	Part – All Pre-requisites removed from UEENEEE025B
UEE60707	Advanced Diploma of Refrigeration and Air-conditioning Engineering	UEE60706 Advanced Diploma of Refrigeration and Air-conditioning Engineering	Full
UEE60807	Advanced Diploma of Refrigeration and Air-conditioning – Technology	UEE60806 Advanced Diploma of Refrigeration and Air-conditioning – Technology	Part – All Pre-requisites removed from UEENEEE025B
UEE60907	Advanced Diploma of Renewable Energy Engineering	UEE60906 Advanced Diploma of Renewable Energy Engineering	Full
UEE61007	Advanced Diploma of Renewable Energy – Technology	UEE61006 Advanced Diploma of Renewable Energy – Technology	Part – All Pre-requisites removed from UEENEED002B and UEENEEE025B
UEE61107	Advanced Diploma of Automated Systems Maintenance Engineering	UEE61106 Advanced Diploma of Automated Systems Maintenance Engineering	Part – All Pre-requisites removed from UEENEEE025B
UEE61207	Advanced Diploma of Engineering – Explosion	UEE61206 Advanced Diploma of Engineering – Explosion protection	Part – All Pre-requisites removed from UEENEEE025B and amendment of Pre-requisite statements in

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AQF Code	Advanced Diploma Qualifications (UEE07)	Former Training Package (UEE06)	Equivalent – full, part, or no
	protection		UEENEEM010B and UEENEEM015B
UEE61307	Advanced Diploma of Electrical – Technology	UEE61306 Advanced Diploma of Electrical – Technology	Part – All Pre-requisites removed from UEENEEG001B and UEENEEG002B

Summary of Units of Competency in this Training Package

Table 8 – UEE11 Electrotechnology Industry Training Package - Competency Standard Units

DISCIPLINE LETTER	UNIT DISCIPLINE	No. of CSUs
A	Assembly	10
B	Broadcast	1
C	Commercial	25
D	Computerised Systems	34
E	Cross-Discipline	67
F	Data and Voice	15
G	Electrical	74
H	Electronic	87

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I	Instrument	56
J	Refrigeration and Air Conditioning	92
K	Renewable and Sustainable	48
M	Hazardous	61
N	Rail	19
P	Restricted	17
R	Research	6
	Total Competency Standard Units	**612**

Full details of the Competency Standards Units in this Training Package including: Unit Code, Title, Weighting Points, AQF Level, Pre-requisites and Qualification Mapping, are contained in the Index of Competency Standard Units, in Volume 1 Part 3 Competency Standards Index of this Training Package.
A mapping Competency Standard Units including the relationship between units which have been amended, added or Removed from versions of Generation Sector Training Package and equivalences is included in Volume 1 Part 3 Competency Standards Index of this Training Package.

Table 9 - Imported Units of Competency in the UEE11 Training Package Version 1

Training Package	Training Package Title	Version	No. of Units
BSB07	Business Services Training Package	5	13
CPC08	Construction, Plumbing and Services Training	6.1	3

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	Package		
HLT07	Health Training Package	4	2
ICT10	Integrated Telecommunications Training Package	1	9
MEM05	Metal and Engineering Training Package	5	12
MSA07	Manufacturing Training Package	6	6
NWP07	Water Training Package	2	20
PMA08	Chemical, Hydrocarbons And Oil Refining Training Package	2.1	1
PRM04	Asset Maintenance Training Package	3	1
RII09	Resources and Infrastructure Industry Training Package	2	5
TLI10	Transport And Logistics Training Package	1.1	4
UEP06	Electricity Supply Industry - Generation Sector Training Package	1.1	3
UET11	Electricity Supply Industry - Transmission, Distribution and Rail Sector Training Package	1	12
Total Imported CSUs			**91**

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Full details of the Imported Units in this Training Package are contained in the Index of Competency Standard Units in Volume 1 Part 3 Competency Standards Index of this Training Package.
Please consult the source Training Package for information, including equivalences, in relation to new and updated imported units included in this version of the Generation Sector Training Package.

List of Imported Units of Competency

Included in this Training Package is a list of units of competency imported from other endorsed training packages into the Electrotechnology Training Package. This advice is detailed in Volume 1 Part 2 – Competency Standards Units Index, Table 2 – section L.

Language, Literacy, Numeracy

The competency standards in this Training Package have been written to reflect the technical and operational needs of industry and include appropriate language and literacy requirements. A new and specific section related to literacy and numeracy skills has been included in the competency standard units for the purposes of providing advice to RTOs on the entry requirements for each unit. It characterises how participants are to be best equipped to achieve the relevant unit, in terms of reading, writing and numeracy skill levels.

Access, Equity and Cultural Diversity

The skills required of employees in the Electrotechnology Industry are comprehensive and are relevant to many different employment situations. The competency standards reflect the range of knowledge and skills and their application, required in the Industry. They are written in a non-exclusive manner so as to increase the participation rates of under-represented groups and to minimise unintentional bias.
As a matter of policy the Electrotechnology Industry and this Training Package excludes no one from participating in competency development, training and employment. This includes encouraging under-represented groups such as indigenous peoples, people with disabilities, women, and people from rural and remote areas or cultural diversity to join the Industry.

Acknowledgments

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- National Electrotechnology Sector Council of the E-Oz Energy Skills Australia Board
- The National Electrotechnology Competency Advisory Council (NECAC)
- The National Electrotechnology Training Advisory Group (NETAG) members
- The Chairs of the discipline Training Advisory Committees (TACs) – electrical and data; refrigeration and air conditioning; instrumentation; industrial control and hazardous areas, renewable and sustainable energy and electronics and computer systems
- The Chairs, Executive Officers, and Members of the State and Territory Utilities and Electrotechnology Network ITABs and their various sub-committees
- The joint E-Oz Energy Skills Australia/Standards Electrical Equipment in Hazardous Areas Competency Advisory Panel (P12) Australia
- The Electrical Regulatory Advisory Council (ERAC)
- ANZETA
- The Trans Tasman Electrotechnology Working Group
- Skills Australia
- The Electrical Occupations Interim advisory Committee
- The Australian Media and Communications Authority
- The State and Territory Training Authorities
- The State and Territory Regulatory Authorities
- Industry sector registered training organisations and practitioners
- Industry sector Peak Bodies, Enterprises and Individual practitioners

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Outline of this Training Package

Outline of this Training Package

The endorsed components of the Training Package are contained in two volumes. Volume 1 covers the overall Package framework and completion requirements for qualifications, and Volume 2 the content details for respective parts and sub-sections of Volume 1. Both volumes form an integrated whole and are not to be used independently of each other.

Volume 1: Structure and Overview

Qualification Framework

This section describes how the qualifications, scope/descriptions, composition and content are structured. Completion and issuance requirements are provided as well as advice on flexibility arrangements, with entry and exit pathways and articulation arrangements. Titles and codes of the list of qualifications to be issued are also included.

Competency Standards

This section describes how the competency standards were developed (in broad terms), the industry coverage they apply to, as well as the format and construction of the individual Competency Standard Units. The index of Competency Standard Units and their scope/description is included in this part. Matters related to language, literacy and numeracy, access, equity and cultural diversity and regulatory arrangements, for which the Competency Standard Units may apply, is also included. The Definitions/Glossary and Essential Knowledge and Associated Skills sections of the Training Package link directly to the Competency Standard Units and no Unit is to be used in isolation or exported without these interrelated components.

Part 3 – Assessment Guidelines

This section outlines how the assessment guidelines inform a Registered Training Organisation (RTO) on the infrastructure requirements they will need to enable them to carry out training delivery assessment activities related to the Training Package. The guidelines include assessment systems, the role of RTOs, assessment pathways, recognition arrangements, assessor qualifications and sources of information.

Volume 2: Competency Standard Units — Content and scope

Volume 2 contains the Competency Standard Units in their respective disciplines.
Volume 2 also contains the Essential Knowledge and Associated Skills, a Matrix mapping the essential knowledge and associated skills (EKAS) to the Unit and to the Definitions/Glossary section, which provides a description of relevant terms and vocabulary that appear in this Package. Also included are definitions relating to literacy and numeracy skills.
Note: The two volumes form an integrated whole and must not be used independently of each other.

Electrotechnology Training Package Layout

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The revised Electrotechnology Training Package has been developed, reviewed and validated through extensive industry consultation. It reflects the views of a wide cross-section of the industry and its key stakeholders/practitioners throughout Australia.
The Training Package has been constructed as a two volume set. Volume 1 covers the overall package framework and completion requirements for qualifications. Volume 2 includes the content details of parts and sub-sections of Volume 1. The two volumes form an integrated whole and are not to be used independently of each other.

Volume 1

Preliminary Information
The Electrotechnology Industry
Overview of Training Packages
The Electrotechnology Industry Training Package
Part 1 Qualifications Framework
Part 2 Competency Standards Overview and Index
Part 3 Assessment Guidelines
Appendix A – Australian Apprenticeships
Appendix B – Sample Assessment Instruments
Enclosures
- Enclosure A: List of Sample Assessment Instruments
- Enclosure B: Administrative Forms
- Enclosure C: Glossary of Terms

Volume 2

Preliminary Information
Part 1 Definitions/Glossary
Part 2 Competency Standards
2.1 Competency Standard Units
A – Assembly
B – Broadcast
C – Commercial
D – Computer systems
E – Cross discipline
F – Data and voice communications
G – Electrical
H – Electronic
I – Instrument and Control
J – Refrigeration and Air Conditioning
K – Renewable and sustainable energy
L – Imported
M – Hazardous areas
N – Rail systems
P – Restricted and specialist
R – Research
2.2 Essential Knowledge and Associated Skills
Volume of: Knowledge and Associated Skills — Reference Codes and Reference Names
Table of Essential Knowledge and Skills to Unit Matrix

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Part 3 Language, Literacy and Numeracy

Important Note to Users

Training Packages are not static documents; they are amended periodically to reflect the latest industry practices and are version controlled. It is essential that the latest version is always used.

Check the version number before commencing training or assessment

This Training Package is Version 1 – check whether this is the latest version by going to the Training.gov.au website (www.training.gov.au) and locating information about the Training Package. Alternatively, contact E-Oz Energy Skills Australia, www.e-oz.com.au to confirm the latest version number.

Explanation of version number conventions

The primary release Training Package is Version 1. When changes are made to a Training Package, sometimes the version number is changed and sometimes it is not, depending on the extent of the change. When a Training Package is reviewed it is considered to be a new Training Package for the purposes of version control, and is Version 1. Do not confuse the version number with the Training Package's national code (which remains the same during its period of endorsement).

Explanation of the review date

The review date (shown on the title page and in the footer of each page) indicates when the Training Package is expected to be reviewed in the light of changes such as changing technologies and circumstances. The review date is not an expiry date. Endorsed Training Packages and their components remain current until they are reviewed or replaced.

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Layout of this Training Package

Layout of this Training Package

Volume 1

Preliminary Information

The Electrotechnology Industry
Overview of Training Packages
The Electrotechnology Industry Training Package

Part 1 Qualifications Framework
Part 2 Competency Standards Overview and Index
Part 3 Assessment Guidelines

Appendix A – Australian Apprenticeships
Appendix B – Sample Assessment Instruments
Enclosures
- Enclosure A: List of Sample Assessment Instruments
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Volume 2

Preliminary Information
Part 1 Definitions/Glossary
Part 2 Competency Standards

2.1 Competency Standard Units

A – Assembly
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N – Rail systems
P – Restricted and specialist
R – Research

2.2 Essential Knowledge and Associated Skills (EKAS)

2.2.1 Table 1 – Knowledge and Associated Skills Relationship

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2.2.2 Appendix 2 – Essential Knowledge and Skills to Unit Matrix

Part 3 Literacy and Numeracy Skills

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AQF qualifications in this Training Package

Summary of AQF Qualifications in this Training Package

Table 1 - AQF qualifications in the Electrotechnology Training Package

AQF	Code	Title
1	UEE10111	Certificate I in ElectroComms Skills
2	UEE20111	Certificate II in Split Air-conditioning and Heat Pumps Systems
2	UEE20411	Certificate II in Winding and Assembly
2	UEE20511	Certificate II in Computer Assembly and Repair
2	UEE20711	Certificate II in Data and Voice Communications
2	UEE20811	Certificate II in Electrical Wholesaling
2	UEE20911	Certificate II in Electronic Assembly
2	UEE21011	Certificate II in Fire Alarms Servicing
2	UEE21211	Certificate II in Antennae Equipment
2	UEE21311	Certificate II in Remote Area Essential Service
2	UEE21411	Certificate II in Remote Area Power Supply Maintenance
2	UEE21611	Certificate II in Security Assembly and Set-up
2	UEE21711	Certificate II in Technical Support
2	UEE21911	Certificate II in Electronics
2	UEE22011	Certificate II in Electrotechnology (Career Start)
2	UEE22111	Certificate II in Sustainable Energy (Career Start)
3	UEE30111	Certificate III in Business Equipment
3	UEE30211	Certificate III in Computer Systems Equipment
3	UEE30311	Certificate III in Custom Electronics Installations
3	UEE30411	Certificate III in Data and Voice Communications

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3	UEE30611	Certificate III in Electrical Machine Repair
3	UEE30711	Certificate III in Switchgear and Controlgear
3	UEE30811	Certificate III in Electrotechnology Electrician
3	UEE30911	Certificate III in Electronics and Communications
3	UEE31011	Certificate III in Fire Protection Control
3	UEE31111	Certificate III in Gaming Electronics
3	UEE31211	Certificate III in Instrumentation and Control
3	UEE31411	Certificate III in Security Equipment
3	UEE31511	Certificate III in Rail – Communications and Networks
3	UEE32011	Certificate III in Renewable Energy - ELV
3	UEE32111	Certificate III in Appliance Service
3	UEE32211	Certificate III in Air-conditioning and Refrigeration
3	UEE33011	Certificate III in Electrical Fitting
4	UEE40111	Certificate IV in Computer Systems
4	UEE40211	Certificate IV in Electrical – Data and Voice Communications
4	UEE40311	Certificate IV in Installation Inspection and Audits
4	UEE40411	Certificate IV in Electrical – Instrumentation
4	UEE40511	Certificate IV in Electrical – Air-conditioning Split Systems
4	UEE40611	Certificate IV in Electrotechnology – Systems Electrician
4	UEE40711	Certificate IV in Electronics and Communications
4	UEE40811	Certificate IV in Electrical – Fire Protection Control Systems
4	UEE40911	Certificate IV in Industrial Electronics and Control
4	UEE41011	Certificate IV in Energy Management and Control
4	UEE41111	Certificate IV in Electrical – Lift Systems
4	UEE41211	Certificate IV in Electrical – Rail Signalling

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4	UEE41511	Certificate IV in Video and Audio Systems
4	UEE41611	Certificate IV in Renewable Energy
4	UEE41711	Certificate IV in Rail – Communications and Network Systems
4	UEE41911	Certificate IV in Electrical – Renewable Energy
4	UEE42011	Certificate IV in Electrical – Photovoltaic systems
4	UEE42111	Certificate IV in Electrotechnology – Electrical Contracting
4	UEE42211	Certificate IV in Instrumentation and Control
4	UEE42611	Certificate IV in Hazardous areas - Electrical
4	UEE42711	Certificate IV in Air-conditioning and Refrigeration Servicing
4	UEE42811	Certificate IV in Air-conditioning Systems Energy Management and Control
4	UEE42911	Certificate IV in Refrigeration and Air-conditioning Systems
4	UEE43011	Certificate IV in Electrical Equipment and Systems
4	UEE43111	Certificate IV in Energy Efficiency and Assessment
4	UEE43211	Certificate IV in Industrial Automation and Control
5	UEE50111	Diploma of Computer Systems Engineering
5	UEE50211	Diploma of Electrical and Instrumentation
5	UEE50311	Diploma of Electrical and Refrigeration and Air-conditioning
5	UEE50411	Diploma of Electrical Engineering
5	UEE50511	Diploma of Electronics and Communications Engineering
5	UEE50711	Diploma of Renewable Energy Engineering
5	UEE50811	Diploma of Research and Development
5	UEE50911	Diploma of Industrial Electronics and Control Engineering
5	UEE51011	Diploma of Instrumentation and Control Engineering
5	UEE51111	Diploma of Engineering Technology - Refrigeration and Air-conditioning

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5	UEE51211	Diploma of Air-conditioning and Refrigeration Engineering
5	UEE53011	Diploma of Electrical Systems Engineering
6	UEE60211	Advanced Diploma of Electronics and Communications Engineering
6	UEE60411	Advanced Diploma of Computer Systems Engineering
6	UEE60611	Advanced Diploma of Industrial Electronics and Control Engineering
6	UEE60911	Advanced Diploma of Renewable Energy Engineering
6	UEE61111	Advanced Diploma of Automated Systems Maintenance Engineering
6	UEE61211	Advanced Diploma of Engineering – Explosion protection
6	UEE61511	Advanced Diploma of Instrumentation and Control Engineering
6	UEE61711	Advanced Diploma of Engineering Technology - Electronics
6	UEE61811	Advanced Diploma of Engineering Technology - Computer Systems
6	UEE62011	Advanced Diploma of Engineering Technology - Renewable Energy
6	UEE62111	Advanced Diploma of Engineering Technology - Electrical
6	UEE62211	Advanced Diploma of Electrical - Engineering
6	UEE62311	Advanced Diploma of Electrical Engineering – Coal Mining
6	UEE62411	Advanced Diploma of Engineering Technology - Air-conditioning and Refrigeration
6	UEE62511	Advanced Diploma of Air-conditioning and Refrigeration Engineering
6	UEE63011	Advanced Diploma of Electrical Systems Engineering

2. Skill Sets

Identified Skill Sets which meet regulatory or specialist requirements recognised by Statements of Attainment have been included to support required industry outcomes. These outcomes generally support requirements associated with regulatory, safety or specialised/hazardous functions of work.

Mapping Qualifications in this Training Package to the former

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Mapping tables in this Training Package provide mapping of current units to previous versions of this Training Package and the former Electrotechnology Training Package (UEE06). These have been included to assist in linking previous units to new units and to assist in minimising any translation issues that may arise.
This information is detailed in Volume 1 Part 1 – Qualifications Framework.

Relationship of Units of Competency to former Training Package and prerequisites

Included in this Training Package is a summary of:

- competency standard units in the Electrotechnology Training Package
- the relationship of the new units to the former competency standard units
- AQF alignment and weighting points of each competency standard unit
- prerequisite requirements.

This information is contained in Volume 1 Part 2 – Competency Standards Index.

List of Imported Units of Competency

Included in this Training Package is a list of units of competency imported from other endorsed training packages into the Electrotechnology Training Package. This advice is detailed in Volume 1 Part 2 – Competency Standards Units Index, Table 2 – section L.

Language, Literacy, Numeracy

The competency standards in this Training Package have been written to reflect the technical and operational needs of industry and include appropriate language and literacy requirements. A new and specific section related to literacy and numeracy skills has been included in the competency standard units for the purposes of providing advice to RTOs on the entry requirements for each unit. It characterises how participants are to be best equipped to achieve the relevant unit, in terms of reading, writing and numeracy skill levels.

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Responsibility for Training Package Maintenance

Responsibility for Training Package Maintenance

The Training Package for the Electrotechnology Industry is managed and maintained by the National Electrotechnology Competency Advisory Council (NECAC) supported by technical committees comprised of the National Electrotechnology Training Advisory Group (NETAG) and specific discipline Technical Advisory Committees (TACs). The composition of the committees is determined by the Electrotechnology Sector Council of E-Oz Energy Skills Australia under declared protocols.

NECAC with its technical sub committees is a standing working group of the ElectroComms and Energy Utilities Industry Skills Council Ltd trading as E-Oz Energy Skills Australia, a DOI declared Industry Skills Council (ISC). The Group is representative of the Electrotechnology industry, regulators, and related stakeholders. It includes Registered Training Organisations (RTOs) from around Australia and employers and union representatives. E-Oz Energy Skills Australia Board and Sector Council determine its composition. The Board and Sector Council may vary NECAC membership from time to time.

The charter of the NECAC is to monitor, review and maintain the Electrotechnology Training Package. This Charter encompasses the following responsibilities:

- *Maintenance of Competency Standards* – to initiate and respond to the need to review, vary, delete and add to the Electrotechnology competency standard units, as part of the sector's standards inventory
- *Maintenance of Competency Delivery Processes* – to monitor the effectiveness of the delivery of competency and so initiate and respond to issues which may impact on those processes
- *Maintenance of Assessment Guidelines* – to monitor the effectiveness of the Assessment Guidelines and supporting systems; to initiate and respond to issues which impact, or are likely to impact, on the quality of the assessment systems and to promote quality improvement throughout the system
- *Maintenance of the Qualification and Recognition Systems* – to monitor the effectiveness of the application of the Qualification and Recognition Systems contained in the Training Package and to review/revise the system as required
- *Validation of Imported Competency Standard Units* – to monitor the effectiveness and value of imported units for the purpose of their inclusion in the Training Package qualifications framework.

The NECAC meets at least annually to review and plan the Industry maintenance and management processes related to the Training Package. The majority of the considerations by the NECAC will require prompt response and, therefore, business and decisions will normally be handled by electronic mail. Support for the NECAC and its technical sub-committees will be provided by the E-Oz Energy Skills Australia, who will act as the secretariat.

The NECAC is an integral part of the Electrotechnology Industry and E-Oz Energy Skills Australia Electrotechnology Sector Council consultative mechanisms.

Membership of the original National Steering Group

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Name	Title	Organisation
Peter Tighe	Chair	EE-Oz Training Standards
Peter Glynn	Chief Executive Officer	National Electrical and Communications Association (National)
John Ingram	Assistant National Secretary	Communications, Electrical and Plumbing Association (National)
Maurice Graham	Chief Executive Officer	VICTECH (Group Training/Private Provider)
James Tinslay	Executive Director	National Electrical and Communications Association (State)
John Karsznia	Network Representative	Electrotechnology Industry Training Advisory Board (Small State)
Ian Neeson	Educational Representative	Technical Consultant
George Adda	Vocational Education and Training Systems Representative	Box Hill Institute (Education)
Jenny Callaghan		National Electrical and Communication Association(Teledata)
Barry Dawson		National Electrical and Communications Association (Group Training)
Bernie Riordon		Electrical Trade Union
Ian McCarthy		Communication, Electrical and Plumbing Union (Communications)
Kevin Fothergill		Telecommunications and Information Technology Advisory Board
Bob Paton		Manufacturing, Engineering and Related Services Industry

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		Training Advisory Board
Christina Zey		Lift Skills Australia
Norm Cahill		Electrotechnology Industry Training Advisory Board (Large State)
John Karsznia		Electrotechnology Industry Training Advisory Board (Small State)
Mike Frew		NSW Technical and Further Education
Warren Miller		Standards Australia
Wolfgang Marshall		Electrotechnology Industry Training Organisation (New Zealand)
Jackie Marks		State/Territories Training Authorities
P J Fleming		National Occupation Health and safety Commission (NOHSC)
Steve Griffiths		Small Business
Neville Palmer		Medium Business
Peter Smith		Large Business
Bob Taylor		Utilities and Light Manufacturing Industry Training Board (Consultant)
Darrel Hills		Technical Consultant
Ian Graham	Regulators Representative	Chair of ERAC
Tony Palladino	Chief Executive Officer	EE-Oz Training Standards
Industry Officers	Observers	DEST
Additional technical representatives were called upon as required		

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Acknowledgments

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- The Chairs, Executive Officers, and Members of the State and Territory Utilities and Electrotechnology Network ITABs and their various sub-committees
- The joint E-Oz Energy Skills Australia/Standards Electrical Equipment in Hazardous Areas Competency Advisory Panel (P12) Australia
- The Electrical Regulatory Advisory Council (ERAC)
- the Australian Communications Authority and the Australian Communications Industry Forum (ACIC)
- The State and Territory Training Authorities
- The State and Territory Regulatory Authorities
- OHS Skills Development and Practical Guidance Team of the National Occupational Health and Safety Commission
- Industry sector registered training organisations and practitioners for contributing to and being supportive of the project
- Industry sector practitioners for contributing to and being supportive of the project.

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Transition to NSSC Training Package packaging rules for Flexibility

Transition to NSSC Training Package packaging rules for Flexibility

The following qualifications have been modified to meet the requirements of the National Skills Standards Council's Training Package packaging rules for flexibility:

UEE10110 Certificate I in Electrotechnology

UEE20110 Certificate II in Split Air-conditioning and Heat Pumps Systems

UEE20510 Certificate II in Computer Assembly and Repair

UEE21310 Certificate II in Remote Area Essential Service

UEE21610 Certificate II in Security Assembly and Setup

UEE21710 Certificate II in Technical Support

UEE21910 Certificate II in Electronics

UEE22010 Certificate II in Electrotechnology (Career Start)

UEE30210 Certificate III in Computer Systems Equipment

UEE30310 Certificate III in Custom Electronics Installations

UEE30910 Certificate III in Electronics and Communications

UEE32110 Certificate III in Appliance Service

UEE32210 Certificate II in Air-conditioning and Refrigeration

UEE40110 Certificate IV in Computer Systems

UEE40710 Certificate IV in Electronics and Communications

UEE41510 Certificate IV in Video and Audio Systems

UEE42710 Certificate IV in Air-conditioning and Refrigeration Servicing

UEE42810 Certificate IV in Air-conditioning Systems Energy Management and Control

UEE42910 Certificate IV in Refrigeration and Air-conditioning Systems

UEE50110 Diploma of Computer Systems Engineering

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UEE50510 Diploma of Electronics and Communications Engineering

UEE51110 Diploma of Engineering Technology – Refrigeration and Air-conditioning

UEE51210 Diploma of Air-conditioning and Refrigeration Engineering

UEE60210 Advanced Diploma of Electronics and Communications Engineering

UEE60410 Advanced Diploma of Computer Systems Engineering

UEE62210 Advanced Diploma of Electrical – Engineering

UEE62310 Advanced Diploma of Electrical Engineering - Coal Mining

UEE62410 Advanced Diploma of Engineering Technology – Air-conditioning and Refrigeration

UEE62510 Advanced Diploma of Air-conditioning and Refrigeration Engineering

Customisation of these qualifications is permitted in order to meet learner's individual needs, their current, intended or future work context, and a variety of possible industry environments.

For this purpose the importation of units up to one sixth of the total points value required for completion of a qualification is permitted from either one or a combination of the following three sources:

- Elsewhere in this Training Package
- Other Training Packages
- Accredited Courses

Units selected for importation under these provisions shall be first packaged in the source Training Package or Accredited Course at the AQF level of the target qualification.

The importation of units from these sources shall be within the boundaries of the integrity of the intended qualification outcomes, the requirements of the Australian Qualifications Framework, the Australian Quality Training Framework, the National Vocation Education and Training Regulator and all regulatory requirements applicable to the imported unit and/or the target qualification.

A maximum of 10 weighting points shall be allocated to units imported from sources other than those managed by E-Oz Energy Skills Australia. Higher valuation of units selected for importation from sources other than E-Oz Training Packages shall be referred to E-Oz Energy Skills Australia for consideration and validation by industry...

Advice should be sought from the relevant state/territory registration and accreditation body to determine if there is a requirement for an extension to a Registered Training Organisation's scope of registration in relation to the imported unit/s.

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Advice should be sought from the registration and accreditation body regarding the requirement to record report the inclusion of units imported under these provisions for the purposes of awarding a qualification.

Where units have been imported under these provisions, this shall be reported to E-Oz Energy Skills Australia so that industry is aware of such units and can consider the endorsement of these into the relevant qualification(s).

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1.1.00 The Australian Qualification Framework

What is the Australian Qualifications Framework?

A brief overview of the Australian Qualifications Framework (AQF) follows. For a full explanation of the AQF, see the AQF Implementation Handbook.
http://www.aqf.edu.au/Portals/0/Documents/Handbook/AQF_Handbook_07.pdf
The AQF provides a comprehensive, nationally consistent framework for all qualifications in post-compulsory education and training in Australia. In the vocational education and training (VET) sector it assists national consistency for all trainees, learners, employers and providers by enabling national recognition of qualifications and Statements of Attainment.
Training Package qualifications in the VET sector must comply with the titles and guidelines of the AQF. Endorsed Training Packages provide a unique title for each AQF qualification which must always be reproduced accurately.

Qualifications

Training Packages can incorporate the following eight AQF qualifications:

- Certificate I in ...
- Certificate II in ...
- Certificate III in ...
- Certificate IV in ...
- Diploma of ...
- Advanced Diploma of ...
- Vocational Graduate Certificate of ...
- Vocational Graduate Diploma of ...

On completion of the requirements defined in the Training Package, a Registered Training Organisation (RTO) may issue a nationally recognised AQF qualification. Issuance of AQF qualifications must comply with the advice provided in the AQF Implementation Handbook and the AQTF 2011 Essential Standards for Initial and Continuing Registration or Standards for NVR Registered Training Organisations 2012.

Statement of Attainment

A Statement of Attainment is issued by a Registered Training Organisation when an individual has completed one or more units of competency from nationally recognised qualification(s)/courses(s). Issuance of Statements of Attainment must comply with the advice provided in the current AQF Implementation Handbook and the AQTF 2010 Essential Standards for Initial and Continuing Registration or Standards for NVR Registered Training Organisations 2012.
Under the AQTF 2010 or Standards for NVR Registered Training Organisations 2012, RTOs must recognise the achievement of competencies as recorded on a qualification or Statement of Attainment issued by other RTOs. Given this, recognised competencies can progressively build towards a full AQF qualification.

AQF Guidelines and Learning Outcomes

The AQF Implementation Handbook provides a comprehensive guideline for each AQF qualification. A summary of the learning outcome characteristics and their distinguishing features for each VET related AQF qualification is provided below.

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Certificate II

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and skills would prepare a person to perform in a range of varied activities or knowledge application where there is a clearly defined range of contexts in which the choice of actions required is usually clear and there is limited complexity in the range of operations to be applied.

Performance of a prescribed range of functions involving known routines and procedures and some accountability for the quality of outcomes.

Applications may include some complex or non-routine activities involving individual responsibility or autonomy and/or collaboration with others as part of a group or team.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

demonstrate basic operational knowledge in a moderate range of areas;

apply a defined range of skills;

apply known solutions to a limited range of predictable problems;

perform a range of tasks where choice between a limited range of options is required;

assess and record information from varied sources;

take limited responsibility for own outputs in work and learning

Certificate III

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and competencies would cover selecting, adapting and transferring skills and knowledge to Australian environments and providing technical advice and some leadership in resolution of specified problems. This would be applied across a range of roles in a variety of contexts with some complexity in the extent and choice of options available.

Performance of a defined range of skilled operations, usually within a range of broader related activities involving known routines, methods and procedures, where some discretion and judgement is required in the section of equipment, services or contingency measures and within known time constraints.

Applications may involve some responsibility for others. Participation in teams including group or team coordination may be involved.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

demonstrate some relevant theoretical knowledge

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apply a range of well-developed skills

apply known solutions to a variety of predictable problems

perform processes that require a range of well-developed skills where some discretion and judgement is required

interpret available information, using discretion and judgement

take responsibility for own outputs in work and learning

take limited responsibility for the output of others

Certificate IV

Characteristics of Learning Outcomes

Breadth, depth and complexity of knowledge and competencies would cover a broad range of varied activities or application in a wider variety of contexts most of which are complex and non-routine. Leadership and guidance are involved when organising activities of self and others as well as contributing to technical solutions of a non-routine or contingency nature.

Performance of a broad range of skilled applications including the requirement to evaluate and analyse current practices, develop Australian criteria and procedures for performing current practices and provision of some leadership and guidance to others in the application and planning of the skills.

Applications involve responsibility for, and limited organisation of, others.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

demonstrate understanding of a broad knowledge base incorporating some theoretical concepts

apply solutions to a defined range of unpredictable problems

identify and apply skill and knowledge areas to a wide variety of contexts, with depth in some areas

identify, analyse and evaluate information from a variety of sources

take responsibility for own outputs in relation to specified quality standards

take limited responsibility for the quantity and quality of the output of others

Diploma

Characteristics of Learning Outcomes

Breadth, depth and complexity covering planning and initiation of alternative approaches to skills or knowledge applications across a broad range of technical and/or management requirements, evaluation and coordination.

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The self directed application of knowledge and skills, with substantial depth in some areas where judgement is required in planning and selecting appropriate equipment, services and techniques for self and others.

Applications involve participation in development of strategic initiatives as well as personal responsibility and autonomy in performing complex technical operations or organising others. It may include participation in teams including teams concerned with planning and evaluation functions. Group or team coordination may be involved.

The degree of emphasis on breadth as against depth of knowledge and skills may vary between qualifications granted at this level.

Distinguishing Features of Learning Outcomes

Do the competencies or learning outcomes enable an individual with this qualification to:

demonstrate understanding of a broad knowledge base incorporating theoretical concepts, with substantial depth in some areas

analyse and plan approaches to technical problems or management requirements

transfer and apply theoretical concepts and/or technical or creative skills to a range of situations

evaluate information, using it to forecast for planning or research purposes

take responsibility for own outputs in relation to broad quantity and quality parameters

take some responsibility for the achievement of group outcomes

Advanced Diploma

Characteristics of Learning Outcomes

Breadth, depth and complexity involving analysis, design, planning, execution and evaluation across a range of technical and/or management functions including development of Australian criteria or applications or knowledge or procedures.

The application of a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts in relation to either varied or highly specific functions. Contribution to the development of a broad plan, budget or strategy is involved and accountability and responsibility for self and others in achieving the outcomes is involved.

Applications involve significant judgement in planning, design, technical or leadership/guidance functions related to products, services, operations or procedures.

The degree of emphasis on breadth as against depth of knowledge and skills may vary between qualifications granted at this level.

Distinguishing Features of Learning Outcomes

Do the competencies or learning outcomes enable an individual with this qualification to:

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demonstrate understanding of specialised knowledge with depth in some areas
analyse, diagnose, design and execute judgements across a broad range of technical or management functions
generate ideas through the analysis of information and concepts at an abstract level
demonstrate a command of wide-ranging, highly specialised technical, creative or conceptual skills
demonstrate accountability for personal outputs within broad parameters
demonstrate accountability for personal and group outcomes within broad parameters

Regulatory Arrangements

Competency Standard Units, Skill Sets and Qualifications in this Training Package have been developed in consultation with the relevant industry technical and business Regulators so that, where appropriate, these align to the requirements of legislation, regulations and mandated codes of practice.

Licensing and regulatory authorities will recognise a range of Qualifications, Units or Skill Sets contained within this Training Package for respective licensing, registration or accreditation purposes. In constructing these qualifications, E-OZ Energy Skills Australia and respective Regulators have given consideration to the link between the issuance of the qualification and the respective regulatory requirements. It is expected that the assessment and preferred training regime which meets the competency outcomes of the qualification and assessment, will therefore meet the regulatory requirements.

In recognising this interrelationship, every effort has been made to ensure currency in regulatory requirements, thus RTOs must ensure they are observed. This includes utilising any recommended industry training program designed to meet the Competency Standard Units and/or Qualification outcomes related to licensing/registration applications.

As RTO's registered under the Australian Quality Training Framework (AQTF) requirements or Standards for NVR Registered Training Organisations 2012, are given full responsibility for deeming a learner/apprentice competent for the respective Competency Standard Units making up a Training Package Qualification or Skill Set, the RTO shall also provide all the necessary documentation (including results preferably percentile based) as required by the regulatory authority to support an application of eligibility for a relevant license, registration or accreditation.

It should be noted that regulatory authorities have advised that the quality of Registered Training Organisations issuing a qualification for regulatory purposes will be monitored. Where deficiencies are identified, regulators may deem it necessary to introduce appropriate actions, including an additional 'external' assessment following the issuing of the qualification to satisfy eligibility requirements for issuing the licence.

Exporting Electrotechnology Industry CSUs from this Training Package

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Competency Standard Units in this Training Package are interrelated and linked with the Definitions/Glossary and Essential Knowledge and Associated Skills sections of the Volume. This also includes information related to language, literacy and numeracy, access, equity, cultural diversity and any regulatory arrangements for which the Competency Standard Units may apply. No Competency Standard Unit can be used in isolation or exported without these interrelated components.

1.1.01 Electrotechnology Industry Qualifications Framework

1.1 Electrotechnology Industry Qualifications Framework

The qualifications listed in this Training Package adhere to the advice provided in the current version of AQF Implementation Handbook. See www.aqf.edu.au.
The qualifications have been designed to comply with the provisions of and comply with the National Skills Standards Council's (NSSC) requirements for Flexibility of Training Package Qualifications to include:

- One Third or more of total units required to gain a VET qualification will be electives.
- The choice of Elective units can be broadened, to allow one sixth of total units to be included from other qualifications in a Training Package, other Training Packages and accredited courses.
- All units as either core or electives.

See: http://www.nssc.natese.gov.au/training_packages
It should be noted that under these provisions Licensed and trade occupations are exempt from these measures.

Application of the NSSC Flexibility Formula

Industry has obtained formal agreement to the continued use of its unit weighting system for valuing individual competency standards and the effort required to achieve a qualification under these provisions.
Thus, for the qualifications in this Training Package, the terms "total units" and "total units required to gain a qualification" and the fractions thereof referred to above are calculated using the weighting points assigned to respective Competency Standard Units (CSU) rather than by a count of individual units. The Qualification Completion Requirements table below summarises the relevant weighting points values to satisfy the packaging rules of each qualification in accordance with the NSSC Policy.
To allow for the inclusion of units imported from other qualifications and other Training Packages and accredited courses under this weighting points system, industry also gained agreement to the following process for importing and valuing such imported units, as follows:

- Customisation of these qualifications is permitted in order to meet learner's individual needs, their current, intended or future work context, and a variety of possible industry environments.
- For this purpose the importation of units up to one sixth of the total points value required for completion of a qualification is permitted from either one or a combination of the following three sources:

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  - Elsewhere in this Training Package
  - Other Training Packages
  - Accredited Courses
- Units selected for importation under these provisions shall be first packaged in the source Training Package or Accredited Course at the AQF level of the target qualification.
- The importation of units from these sources shall be within the boundaries of the integrity of the intended qualification outcomes, the requirements of the Australian Qualifications Framework, the Australian Quality Training Framework or Standards for NVR Registered Training Organisations 2012 and all regulatory requirements applicable to the imported unit and/or the target qualification.
- Minimum points (10) will be allocated to units imported from sources other than those managed by E-Oz Energy Skills Australia. Advice on the valuation of units selected for importation from sources other than E-Oz Energy Skills Australia shall be sought from the relevant E-Oz Technical Advisory Committee.

Advice shall be sought from the relevant state/territory registration and accreditation body to determine if there is a requirement for an extension to a Registered Training Organisation's scope of registration in relation to the inclusion of such imported unit/s into a qualification.
Advice shall be sought from the relevant registration and accreditation body regarding the requirement to record and report the inclusion of units imported under these provisions for the purposes of awarding a qualification.
Where units have been imported under these provisions, this shall be reported to E-Oz Energy Skills Australia so that industry is aware of such units and can consider the endorsement of these into the relevant qualification(s).

Qualification Mapping

Please refer to Volume 1 Preliminary Information for:

- Modifications History of Qualifications in this Training Package
- Mapping of the qualifications in this version of the Electrotechnology Training Package to previous versions, including equivalences

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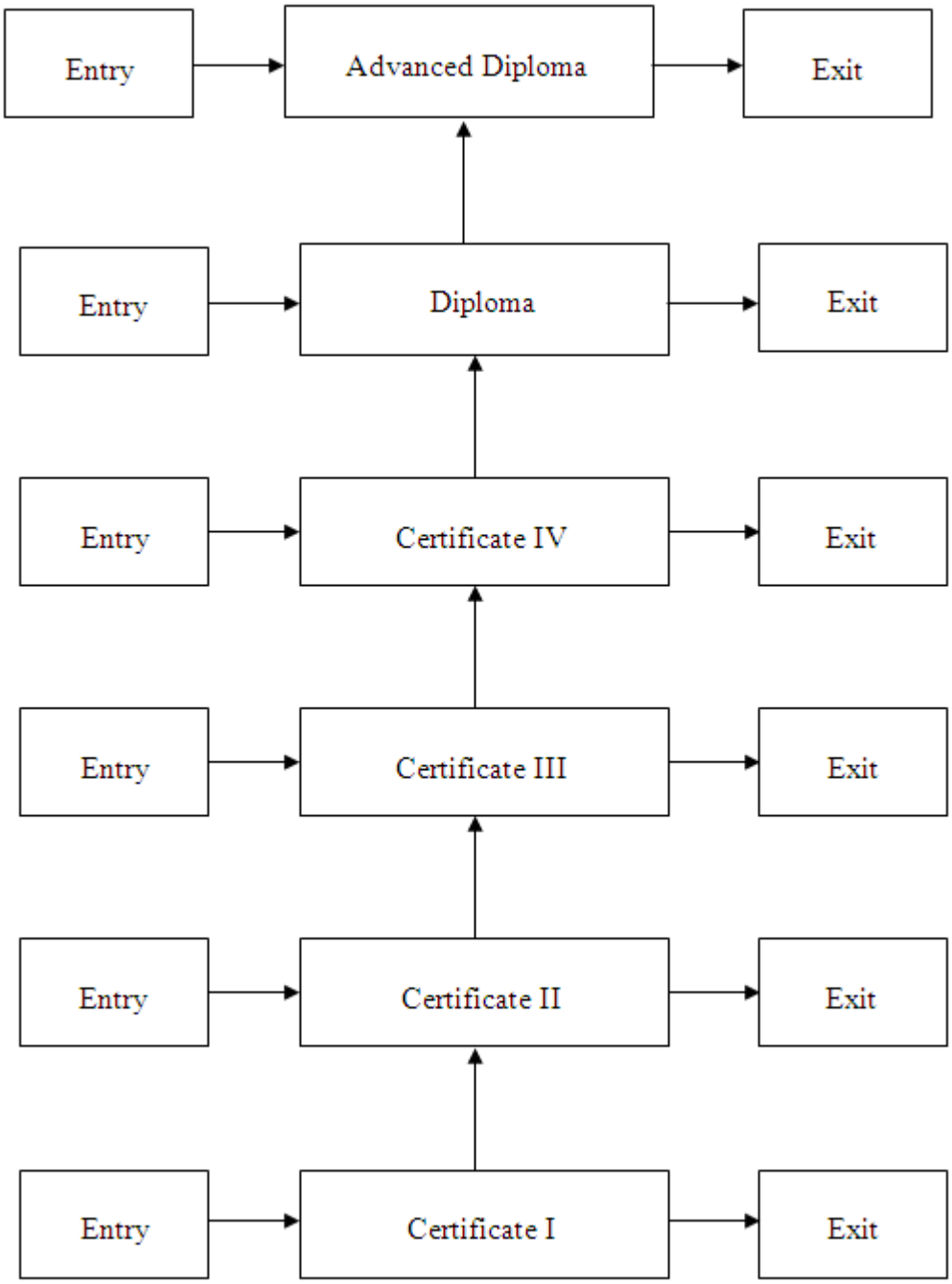
1.1.02 Qualification Pathways

1.2 Qualification Pathways

This Training Package provides open entry at each of the AQF levels. Arrows indicate the pathways that can be followed no matter at which qualification level you enter.

Entry and Exit Points for Electrotechnology Industry Qualification



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For more information on the latest Training Package vocational standards qualifications and qualification pathways visit ElectroComms and EnergyUtilities Industry Skills Council Ltd trading as E-Oz Energy Skills Australia at www.e-oz.com.au

Articulation pathways

Qualification articulation, and entry and exit arrangements are based on the specific training and education requirements endorsed by the industry. The construction of individual competency standard units and the groups of units that make up individual qualifications are of particular significance to the operational, regulatory and safety arrangements of the industry. Each qualification provides a unique vocational outcome that can be used for apprentices as entry-level contracted employees.
Australian Apprenticeship arrangements therefore apply to all qualifications; however, they are subject to State/Territory statutory requirements, prescriptions within industrial instruments and policies of State/Territory training authorities.
Open entry is available to all qualifications provided the prospective learner's general education and competency level is equivalent to the outcome of four to five years of secondary school. Additionally, open access provides an option for potential learners to choose a qualification suited to their needs while providing flexibility for recruitment action by employers. Entry requirements must be met. Where entry requirements are not met, a bridging program would be developed by an RTO in consultation with E-Oz Energy Skills Australia. Entry into all qualifications is available through Recognised Prior Learning (RPL) arrangements.

School Based Australian Apprenticeships

Australian Apprenticeships are declared in each State or Territory according to the particular processes of the jurisdiction and requirements identified by industry in the State or Territory. Declarations for particular qualifications as either Traineeships or Apprenticeships are made accordingly and therefore the same qualification may be classified differently between jurisdictions.
Whilst E-Oz has no control over these processes and declarations, it would recommend that the following qualifications be considered when addressing School based Australian Apprenticeships:

AQF Code	Qualification Title
UEE10110	Certificate I in ElectroComms Skills
UEE22010	Certificate II in Electrotechnology (Career Start)
UEE22107	Certificate II in Sustainable Energy (Career Start)

Access, Equity and Cultural Diversity

The skills required of employees in the Electrotechnology Industry are relevant to many work positions/roles. The qualifications in this Training Package reflect this range of competencies and are written in a non-exclusive manner to increase equity of participation for all disadvantaged groups and to minimise unintentional bias.

Language, Literacy and Numeracy

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A new section related to language, literacy and numeracy skills has been included in each competency standard unit. It provides RTOs, industry and career aspirants with relevant language, literacy and numeracy entry-level advice, to maximise the prospects of successful completion of the unit and any qualification(s).
The language, literacy and numeracy definitions and requirements are described in more detail in Volume 2, Part 3 Language, Literacy and Numeracy Skills. Each Competency Standard Unit in Volume 2 references the respective language, literacy and numeracy skills that apply.

Australian Apprenticeship – application

Australian Apprenticeships are work-related competency programs designed for entry-level contracted employment for new entrants to the industry. For further information regarding Australian Apprenticeships and their application in relation to this Training Package, refer to Appendix A, Australian Apprenticeship – application. Appendix A is located at the end of Volume 1.

1.1.03 Qualification Employability Skills Statements

1.3 Qualification Employability Skills Statements

The Employability Skills facets for each AQF level are described below. Thesee are broad industry requirements that may vary depending on qualification packaging rules and electives selected.

Employability Skills Summary - All Qualifications at AQF Level 1.

The following table contains a summary of the Employability Skills required by the Electrotechnology Industry for all UEE11 Electrotechnology Training Package qualifications at AQF level 1, namely;
The Employability Skills facets described here are broad industry requirements that may vary depending on qualification packaging rules and options.

Communication
Collect, organise and understand information related to the work task and it’s relevant safety procedures
Access, read and comprehend safety instructions and procedures
Share information via speech and in writing
Prepare time sheets
Teamwork
Work with others to generate and review ideas
Work effectively as an individual and as a member of a team

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Relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities
Contribute to a positive culture of compliance within an organisation
Develop and maintain networks for the implementation and maintenance of industry knowledge, standards and requirements
Provide feedback
Problem Solving
Apply lateral thinking to generate solutions in response to work problems
Identify, assess and prioritise work risks to maintain efficiency, quality, productivity and workplace safety at all times
Initiative & Enterprise
Identify and comply with all requirements and standards for work in the Electrotechnology industry
Initiate and follow through on the implementation of industry standards in the workplace
Planning & Organising
Plan and organise activities including the maintenance and layout of own worksite and obtain equipment and materials to avoid work flow interruptions or wastage
Plan activities to enable operational skills and knowledge to be gained and maintained
Identify related industry compliance requirements
Maintain relevant industry and work records
Establish clear goals and deliverables
Collect, analyse and organise work task information
Apply time management prioritising techniques
Self Management
Plan own work within given task parameters
Set, monitor and satisfy personal work goals
Accept responsibility for given tasks

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Apply systematic and effective time management
Learning
Satisfy the competency requirements for the job
Maintain current knowledge of tools, devices, instruments, materials, work practices and systems
Seek learning opportunities
Take control of and manage own learning
Adopt a open approach to new ideas and techniques
Commit to and promote a culture of continuous learning
Set realistic learning goals for self development
Technology
Use workplace technology related to particular work tasks including tools, devices, instruments and materials
Attain and maintain IT skills relevant to the Electrotechnology industry
Be willing to gain knowledge and skills relevant to new and emerging technologies

The Employability Skills described above are representative of the Electrotechnology Industry in general and may not reflect enterprise specific requirements or job roles. Learning and assessment strategies for each qualification should be based on the requirements of the units of competency comprising the qualification and the Assessment Guidelines, Volume 1, Part 3.

Employability Skills Summary for all Qualifications at AQF Level 2.

The following table contains a summary of the Employability Skills required by the Electrotechnology Industry for all UEE11 Electrotechnology Training Package qualifications at AQF level 2, namely;
The Employability Skills facets described here are broad industry requirements that may vary depending on qualification packaging rules and options.

Communication
Collect, organise and understand information related to the work task and it’s relevant safety procedures
Communicate ideas and information to enable confirmation of work requirement and

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specifications
Co-operate with other workers/customers and report outcomes and/or any problems
Access, read and comprehend safety instructions and procedures
Share information via speech and in writing
Prepare time sheets
Teamwork
Work with others to generate and review ideas
Work effectively as an individual and as a member of a team
Work with others and in a team to identify work needs and review ideas against those needs
Relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities
Contribute to a positive culture of compliance within an organisation
Develop and maintain networks for the implementation and maintenance of industry knowledge, standards and requirements
Provide feedback
Problem Solving
Apply lateral thinking ideas to generate solutions in response to work problems
Anticipate or clarify problems to avoid interruptions to work flows and processes
Identify, assess and prioritise work risks to maintain efficiency, quality, productivity and work place safety at all times
Initiative & Enterprise
Identify and comply with all requirements and standards for work in the Electrotechnology industry
Apply enterprise best practice and quality systems
Interact effectively with both internal and external industry stakeholders
Initiate and follow through on the implementation of industry standards in the workplace

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Planning & Organising
Plan and organise activities including the maintenance and layout of own worksite and obtain equipment and materials to avoid work flow interruptions or wastage
Identify related industry compliance requirements
Maintain relevant industry and work records
Establish clear implementation goals and deliverables
Collect, analyse and organise work task information
Apply time management prioritising techniques
Self Management
Plan own work within given task parameters
Set, monitor and satisfy personal work goals
Accept responsibility for given tasks
Apply systematic and effective time management
Learning
Satisfy the competency requirements for the job
Maintain current knowledge of tools, devices, instruments, materials, work practices and systems
Seek learning opportunities
Take control and manage own learning
Adopt a open approach to new ideas and techniques
Commit to and promote a culture of continuous learning
Set realistic learning goals for self development
Monitor and respond to learning process achievements
Technology
Use workplace technology related to the particular work tasks including tools, devices, instruments and materials
Attain and maintain required technical accreditation/authority under the industry

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standards
Attain and maintain IT skills relevant to the Electrotechnology industry
Be willing to gain knowledge and skills relevant to new and emerging technologies

The Employability Skills described above are representative of the Electrotechnology Industry in general and may not reflect enterprise specific requirements or job roles. Learning and assessment strategies for each qualification should be based on the requirements of the units of competency comprising the qualification and the Assessment Guidelines, Volume 1, Part 3.\

Employability Skills Summary for all Qualifications at AQF Level 3.

The following table contains a summary of the Employability Skills required by the Electrotechnology Industry for all UEE11 Electrotechnology Training Package qualifications at AQF level 3, namely;
The Employability Skills facets described here are broad industry requirements that may vary depending on qualification packaging rules and options.

Communication
Collect, organise and understand information related to the work task and it's relevant safety procedures
Communicate ideas and information to enable confirmation of work requirement and specifications
Communicate information using drawing, diagrams, schedules and manuals
Communicate and/or report work outcomes and/or any problems
Communicate ideas, information and advice to co-workers/clients to enable confirmation of product/work requirements and specifications
Communicate effectively in oral and written form
Access, read and comprehend safety instructions and procedures
Collect, organise and understand information related to a work task and it's relevant safety procedures
Undertake negotiations if there are conflicts in work requirements and/or priorities
Share industry information
Document work quotations and tender support schedules
Prepare time sheets

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Prepare documentation on particular work tasks including evaluations, reports, timesheets and costing
Prepare and present formal reports to clients and/or co-workers
Teamwork
Work with others to generate ideas and review
Work effectively as an individual and as a member of a team
Work with others and in a team to identify work needs and review ideas against those needs
Work with other and in a team to evaluate and report on work tasks and outcomes
Work with others and in a team to present information to a client and/or co-worker
Relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities
Influence individuals and teams
Develop and maintain networks for implementation and maintenance of industry standards in relation to workplace computer systems
Develop and maintain networks for the implementation and maintenance of industry knowledge, standards and requirements
Coach/mentor others and provide feedback
Problem Solving
Apply lateral thinking ideas to generate solutions in response to work problems
Apply operational research and research management skills
Clarify and identify work issues and apply processes to avoid interruptions to work flow/processes
Clarify problems and enterprise ideas to avoid interruptions to work flow/processes
Use testing techniques to anticipate or clarify problems to avoid interruptions to work flows and process
Generate ideas and alternatives
Analyse information to identify opportunities to develop solutions
Identify, assess and prioritise work risks to maintain efficiency, quality,

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productivity and work place safety at all times
Initiative & Enterprise
Recognise and respond to circumstances outside instructions or personal competence
Be proactive and apply strategies to overcome work blockages
Adopt proactive relationships with clients and co-workers
Identify and comply with all requirements and standards for work in the Electrotechnology industry
Apply enterprise best practice and quality systems
Generate ideas and translate into workplace actions and outcomes
Interact effectively with both internal and external industry stakeholders
Initiate and follow through on the implementation of the industry standards in the workplace
Translate ideas into action
Planning & Organising
Plan and organise activities including the maintenance and layout of own worksite and obtain equipment and materials to avoid work flow interruptions or wastage
Plan and organise activities to enable choices of maintenance methods of equipment, tools and related work documentation
Plan activities to enable choice of analysis/testing techniques of work outcomes and systems
Develop industry work plans including key performance indicators
Use mathematical ideas and techniques to correctly complete measurements, calculate quantities, estimate material, labour and overhead requirements and accurately cost the product/service
Use computing capabilities that enable the use of mathematical ideas and techniques to correctly complete measurements, calculate quantities, estimate material, labour and overhead requirements and accurately cost the product/service
Identify related industry compliance requirements
Identify, access and allocate required implementation resources

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Maintain relevant industry and work records
Maintain relevant industry/work record systems
Maintain industry related records
Understand computer systems, their relationships and applications in the workplace
Establish clear implementation goals and deliverables
Monitor and optimise resource utilisation
Self Management
Plan own work within given task parameters
Set, monitor and satisfy personal work goals
Accept responsibility for given tasks
Clarify and confirm work instructions
Clarify own roles, goals, prerogatives and limitations in relation to the industry
Take responsibility for industry obligations
Evaluate and monitor own performance
Apply systematic and effective time management
Learning
Satisfy the competency requirements for the job
Maintain current knowledge of tools, devices, instruments, materials, work practices and systems
Seek learning opportunities
Provide technical instruction and learning assistance to assigned apprentices, trainees or other less experienced workers
Take control and manage own learning
Adopt a open approach to new ideas and techniques
Commit to and promote a culture of continuous learning
Set realistic learning goals for self development

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Monitor and respond to learning process achievements
Technology
Use workplace technology to communicate with the client, document and present information
Use electronic information systems to communicate with co-workers and/or other related personnel
Use workplace technology related to the particular work tasks including tools, devices, instruments and materials
Use work place technology to collate, organise and maintain work documentation and information
Attain and maintain required technical accreditation/authority under the industry standards
Attain and maintain IT skills relevant to the Electrotechnology industry
Be willing to learn new IT skills
Be willing gain knowledge and skills relevant to new and emerging technologies

The Employability Skills described above are representative of the Electrotechnology Industry in general and may not reflect enterprise specific requirements or job roles. Learning and assessment strategies for each qualification should be based on the requirements of the units of competency comprising the qualification and the Assessment Guidelines, Volume 1, Part 3.

Employability Skills Summary for all Qualifications at AQF Level 4.

The following table contains a summary of the Employability Skills required by the Electrotechnology Industry for all UEE11 Electrotechnology Training Package qualifications at AQF level 4, namely;
The Employability Skills facets described here are broad industry requirements that may vary depending on qualification packaging rules and options.

Communication
Collect, organise and understand information related to the work task and it’s relevant safety procedures
Communicate ideas and information to enable confirmation of work requirement and specifications
Communicate information using drawing, diagrams, schedules and manuals
Communicate and/or report work outcomes and/or any problems

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Communicate effectively in oral and written form
Access, read and comprehend safety instructions and procedures
Undertake negotiations if there are conflicts in work requirements and/or priorities
Share industry information
Share essential business information
Document work quotations and tender support schedules
Process approvals/authorities for industry activities
Prepare time sheets
Prepare documentation on particular work tasks including evaluations, reports, timesheets and costing
Prepare and present formal reports to clients and/or co-workers or other related personnel
Teamwork
Work with others by recognising dependencies and using co-operative approaches to optimise work flow and productivity
Work with others to generate ideas and review
Work effectively as an individual and as a member of a team
Work with others to identify work needs and review ideas against those needs
Work with others to evaluate and report on work tasks and outcomes
Work with others to present information to a client and/or co-worker(s)
Relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities
Influence individuals and teams
Develop and maintain networks for the implementation and maintenance of industry knowledge, standards and requirements
Coach/mentor others and provide feedback
Problem Solving
Use testing and analysis techniques to anticipate and/or clarify problems and plan

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around them to avoid interruptions to work flows/processes
Apply lateral thinking to generate solutions in response to work problems
Apply analytical techniques to anticipate design issues and product needs
Apply operational research and research management skills
Clarify and identify work issues and apply processes to avoid interruptions to work flow/processes
Analyse information to identify opportunities to develop solutions
Identify, assess and prioritise work risks to maintain efficiency, quality, productivity and work place safety at all times
Initiative & Enterprise
Recognise and respond to circumstances outside instructions or personal competence
Create new opportunities for the enterprise
Be proactive and apply strategies to overcome work blockages
Adopt a proactive relationship with clients/co-workers
Identify work needs by applying research techniques
Identify and comply with all requirements and standards for work in the Electrotechnology industry
Apply and enterprise best practice and quality systems
Apply and enterprise the best computer systems and applications to ensure quality and efficiency of work tasks and documentation
Generate ideas and translate into workplace actions and outcomes
Interact effectively with both internal and external industry stakeholders
Initiate and follow through on the implementation of industry standards in the workplace
Translate ideas into action
Planning & Organising
Plan and organise activities including the maintenance and layout of own worksite and obtain equipment and materials to avoid work flow interruptions or wastage

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Plan and organise activities to enable choices of maintenance methods of equipment, tools and related work documentation
Plan activities to enable choice of analysis/testing techniques of work outcomes and systems
Plan and organise activities to enable the most appropriate testing/analysis procedures to be implemented
Plan activities to enable choice of the best computer systems/programs for application on a particular work task
Develop industry work plans including key performance indicators
Use mathematical ideas and techniques to correctly complete measurements, calculate quantities, estimate material, labour and overhead requirements and accurately cost the product/service
Use computing capabilities that enable the use of mathematical ideas and techniques to correctly complete measurements, calculate quantities, estimate material, labour and overhead requirements and accurately cost the product/service
Identify related industry compliance requirements
Identify, access and allocate required implementation resources
Maintain relevant industry and work records
Maintain relevant industry/work record systems
Maintain industry related records
Understand computer systems, their relationships and applications in the workplace
Establish clear implementation goals and deliverables
Monitor and optimise resource utilisation
Self Management
Plan own work within given task parameters
Maintain current knowledge of computer systems and capabilities
Set, monitor and satisfy personal work goals
Accept responsibility for given tasks
Clarify and confirm work instructions

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Clarify own roles, goals, prerogatives and limitations in relation to the industry
Take responsibility for industry obligations
Evaluate and monitor own performance
Apply systematic and effective time management
Learning
Satisfy the competency requirements for the job
Maintain current knowledge of tools, devices, instruments, materials, work practices and systems
Maintain current knowledge of computer systems programs and there relevant applications
Seek learning opportunities
Provide technical instruction and learning assistance to assigned apprentices, trainees or other less experienced workers
Take control and manage own learning
Adopt a open approach to new ideas and techniques
Commit to and promote a culture of continuous learning
Set realistic learning goals for self development
Monitor and respond to learning process achievements
Technology
Use workplace technology to document and present information
Use workplace technology to communicate with clients, co-workers and/or other related personnel
Use workplace technology related to particular work tasks including tools, equipment, devices, instruments and materials
Use workplace technology for data analysis/investigation
Attain and maintain required technical accreditation/authority under the industry standards
Attain and maintain IT skills relevant to the Electrotechnology industry

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Be willing to learn new IT skills
Use workplace technology to collate, organise and maintain work documentation and information
Use computer applications as a management tool

The Employability Skills described above are representative of the Electrotechnology Industry in general and may not reflect enterprise specific requirements or job roles. Learning and assessment strategies for each qualification should be based on the requirements of the units of competency comprising the qualification and the Assessment Guidelines, Volume 1, Part 3.

Employability Skills Summary for all Qualifications at AQF Level 5.

The following table contains a summary of the Employability Skills required by the Electrotechnology Industry for all UEE11 Electrotechnology Training Package qualifications at AQF level 5, namely;
The Employability Skills facets described here are broad industry requirements that may vary depending on qualification packaging rules and options.

Communication
Collect, organise and understand information related to the work task and it's relevant safety procedures
Communicate ideas and information to enable confirmation of work requirement and specifications
Communicate information using drawing, diagrams, schedules and manuals
Communicate and/or report work outcomes and/or any problems
Communicate effectively in oral and written form
Access, read and comprehend safety instructions and procedures
Undertake negotiations if there are conflicts in work requirements and/or priorities
Share industry information
Share essential business information
Document work quotations and tender support schedules
Process approvals/authorities for industry activities
Prepare time sheets
Prepare documentation on particular work tasks including evaluations, reports,

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timesheets and costing
Prepare and present formal reports to clients and/or co-workers or other related personnel
Use aesthetic ideas to plan visual presentation material
Teamwork
Work with others by recognising dependencies and using co-operative approaches to optimise work flow and productivity
Work with others to generate ideas and review
Work effectively as an individual and as a member of a team
Work with others to identify work needs and review ideas against those needs
Work with others to evaluate and report on work tasks and outcomes
Work with others to present information to a client and/or co-worker(s)
Relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities
Influence individuals and teams
Develop and maintain networks for the implementation and maintenance of industry knowledge, standards and requirements
Coach/mentor others and provide feedback
Problem Solving
Use testing and analysis techniques to anticipate and/or clarify problems and plan around them to avoid interruptions to work flows/processes
Apply lateral thinking to generate solutions in response to work problems
Apply analytical techniques to anticipate design issues and product needs
Apply operational research and research management skills
Apply contingency management techniques to variable circumstances
Clarify and identify work issues and apply processes to avoid interruptions to work flow/processes
Analyse information to identify opportunities to develop solutions

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Identify, assess and prioritise work risks to maintain efficiency, quality, productivity and work place safety at all times
Initiative & Enterprise
Recognise and respond to circumstances outside instructions or personal competence
Create new opportunities for the enterprise
Be proactive and apply strategies to overcome work blockages
Adopt a proactive relationship with clients/co-workers
Identify work needs by applying research techniques
Identify and comply with all requirements and standards for work in the Electrotechnology industry
Apply and enterprise best practice and quality systems
Apply and enterprise the best computer systems and applications to ensure quality and efficiency of work tasks and documentation
Generate ideas and translate into workplace actions and outcomes
Interact effectively with both internal and external industry stakeholders
Initiate and follow through on the implementation of industry standards in the workplace
Translate ideas into action
Planning & Organising
Plan and organise activities including the maintenance and layout of own worksite and obtain equipment and materials to avoid work flow interruptions or wastage
Plan and organise activities to enable choices of maintenance methods of equipment, tools and related work documentation
Plan activities to enable choice of analysis/testing techniques of work outcomes and systems
Plan and organise activities to enable the most appropriate testing/analysis procedures to be implemented
Plan activities to enable choice of the best computer systems/programs for application on a particular work task

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Develop industry work plans including key performance indicators
Use mathematical ideas and techniques to correctly complete measurements, calculate quantities, estimate material, labour and overhead requirements and accurately cost the product/service
Use computing capabilities that enable the use of mathematical ideas and techniques to correctly complete measurements, calculate quantities, estimate material, labour and overhead requirements and accurately cost the product/service
Identify related industry compliance requirements
Identify, access and allocate required implementation resources
Maintain relevant industry and work records
Maintain relevant industry/work record systems
Maintain industry related records
Understand computer systems, their relationships and applications in the workplace
Establish clear implementation goals and deliverables
Monitor and optimise resource utilisation
Self Management
Plan own work within given task parameters
Set, monitor and satisfy personal work goals
Accept responsibility for given tasks
Clarify and confirm work instructions
Clarify own roles, goals, prerogatives and limitations in relation to the industry
Take responsibility for industry obligations
Evaluate and monitor own performance
Apply systematic and effective time management
Learning
Satisfy the competency requirements for the job
Maintain current knowledge of tools, devices, instruments, materials, work practices

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and systems
Maintain current knowledge of computer systems programs and there relevant applications
Seek learning opportunities
Provide technical instruction and learning assistance to assigned apprentices, trainees or other less experienced workers
Take control and manage own learning
Adopt a open approach to new ideas and techniques
Commit to and promote a culture of continuous learning
Set realistic learning goals for self development
Monitor and respond to learning process achievements
Technology
Use workplace technology to document and present information
Use workplace technology to communicate with clients, co-workers and/or other related personnel
Use workplace technology related to particular work tasks including tools, equipment, devices, instruments and materials
Use workplace technology for data analysis/investigation
Attain and maintain required technical accreditation/authority under the industry standards
Attain and maintain IT skills relevant to the Electrotechnology industry
Be willing to learn new IT skills
Use workplace technology to collate, organise and maintain work documentation and information
Use computer applications as a management tool

The Employability Skills described above are representative of the Electrotechnology Industry in general and may not reflect enterprise specific requirements or job roles. Learning and assessment strategies for each qualification should be based on the requirements of the units of competency comprising the qualification and the Assessment Guidelines, Volume 1, Part 3.

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Employability Skills Summary for all Qualifications at AQF Level 6.

The following table contains a summary of the Employability Skills required by the Electrotechnology Industry for all UEE11 Electrotechnology Training Package qualifications at AQF level 6, namely;
The Employability Skills facets described here are broad industry requirements that may vary depending on qualification packaging rules and options.

Communication
Collect, organise and understand information related to the work task and it's relevant safety procedures
Communicate ideas and information to enable confirmation of work requirement and specifications
Communicate information using drawing, diagrams, schedules and manuals
Communicate and/or report work outcomes and/or any problems
Communicate effectively in oral and written form
Access, read and comprehend safety instructions and procedures
Undertake negotiations if there are conflicts in work requirements and/or priorities
Share industry information
Share essential business information
Share essential IT/Computing information
Document work quotations and tender support schedules
Process approvals/authorities for industry activities
Prepare documentation on particular work tasks including evaluations, reports, timesheets and costing
Prepare and present formal reports to clients and/or co-workers or other related personnel
Use aesthetic ideas to plan visual presentation material
Teamwork
Work with others by recognising dependencies and using co-operative approaches to optimise work flow and productivity
Work with others to generate ideas and review

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Work effectively as an individual and as a member of a team
Work with others to identify work needs and review ideas against those needs
Work with others to evaluate and report on work tasks and outcomes
Work with others to present information to a client and/or co-worker(s)
Relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities
Influence individuals and teams
Develop and maintain networks for the implementation and maintenance of industry knowledge, standards and requirements
Coach/mentor others and provide feedback
Problem Solving
Use testing and analysis techniques to anticipate and/or clarify problems and plan around them to avoid interruptions to work flows/processes
Apply lateral thinking to generate solutions in response to work problems
Apply analytical techniques to anticipate design issues and product needs
Apply operational research and research management skills
Apply contingency management techniques to variable circumstances
Clarify and identify work issues and apply processes to avoid interruptions to work flow/processes
Analyse information to identify opportunities to develop solutions
Identify, assess and prioritise work risks to maintain efficiency, quality, productivity and work place safety at all times
Initiative & Enterprise
Recognise and respond to circumstances outside instructions or personal competence
Create new opportunities for the enterprise
Be proactive and apply strategies to overcome work blockages
Adopt a proactive relationship with clients/co-workers

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Identify work needs by applying research techniques
Identify and comply with all requirements and standards for work in the Electrotechnology industry
Apply and enterprise best practice and quality systems
Apply and enterprise the best computer systems and applications to ensure quality and efficiency of work tasks and documentation
Generate ideas and translate into workplace actions and outcomes
Interact effectively with both internal and external industry stakeholders
Initiate and follow through on the implementation of industry standards in the workplace
Translate ideas into action
Planning & Organising
Plan and organise activities including the maintenance and layout of own worksite and obtain equipment and materials to avoid work flow interruptions or wastage
Plan and organise activities to enable choices of maintenance methods of equipment, tools and related work documentation
Plan activities to enable choice of analysis/testing techniques of work outcomes and systems
Plan and organise activities to enable the most appropriate testing/analysis procedures to be implemented
Plan activities to enable choice of the best computer systems/programs for application on a particular work task
Develop industry work plans including key performance indicators
Use mathematical ideas and techniques to correctly complete measurements, calculate quantities, estimate material, labour and overhead requirements and accurately cost the product/service
Use computing capabilities that enable the use of mathematical ideas and techniques to correctly complete measurements, calculate quantities, estimate material, labour and overhead requirements and accurately cost the product/service
Identify related industry compliance requirements
Identify, access and allocate required implementation resources

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Maintain relevant industry and work records
Maintain relevant industry/work record systems
Maintain industry related records
Understand computer systems, their relationships and applications in the workplace
Understand business systems and their relationships
Establish clear implementation goals and deliverables
Monitor and optimise resource utilisation
Self Management
Plan own work within given task parameters
Set, monitor and satisfy personal work goals
Accept responsibility for given tasks
Clarify and confirm work instructions
Clarify own roles, goals, prerogatives and limitations in relation to the industry
Take responsibility for industry obligations
Evaluate and monitor own performance
Apply systematic and effective time management
Learning
Satisfy the competency requirements for the job
Maintain current knowledge of tools, devices, instruments, materials, work practices and systems
Maintain current knowledge of computer systems programs and there relevant applications
Seek learning opportunities
Provide technical instruction and learning assistance to assigned apprentices, trainees or other less experienced workers
Take control and manage own learning

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Adopt a open approach to new ideas and techniques
Commit to and promote a culture of continuous learning
Set realistic learning goals for self development
Monitor and respond to learning process achievements
Technology
Use workplace technology to document and present information
Use workplace technology to communicate with clients, co-workers and/or other related personnel
Use workplace technology related to particular work tasks including tools, equipment, devices, instruments and materials
Use workplace technology for data analysis/investigation
Attain and maintain required technical accreditation/authority under the industry standards
Attain and maintain IT skills relevant to the Electrotechnology industry
Be willing to learn new IT skills
Use workplace technology to collate, organise and maintain work documentation and information
Use computer applications as a management tool

The Employability Skills described above are representative of the Electrotechnology Industry in general and may not reflect enterprise specific requirements or job roles. Learning and assessment strategies for each qualification should be based on the requirements of the units of competency comprising the qualification and the Assessment Guidelines, Volume 1, Part 3.

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1.1.04 Qualification Scope, Work Function and Environment

1.4 Qualification Scope, Work Function and Environment

The qualifications described in this section of the Training Package have been designed and structured by industry in consultation with a range of stakeholders including regulators, RTOs and the community. They address identified work functions and work environments and facilitate worthwhile career pathways within the industry.
The qualification structures that follow must be read in conjunction with Volume 1 Part 2 — Competency Standards, Unit Construction.

Certificate I

Characteristics of Learning Outcomes

Knowledge and skills to perform a defined range of routine and predictable activities.

Applications may include a variety of employment-related skills, including preparatory access and participation skills, broad based induction skills and/or specific workplace skills. They may also include participation in a team or work group.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate knowledge by recall in a narrow range of areas
- demonstrate basic practical skills, such as the use of relevant tools
- perform a sequence of routine tasks given clear direction
- receive and pass on messages/information

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate I Qualifications**	**Descriptions and Scopes**
UEE10111	Certificate I in ElectroComms Skills	Perform basic work activities, including identifying and using a range of components, accessories, materials, tools, equipment, technologies, and customs for carrying out work in the Electrotechnology-Communications Industry. Sectors in the industry are electronics, electrical, communications including telecommunications – voice, data, video and information technology, computer systems, instrumentation, lifts, refrigeration and air conditioning, and renewable/sustainable energy.

Certificate II

Characteristics of Learning Outcomes

Knowledge and skills to perform a prescribed range of functions in clearly defined contexts with limited complexity in the range of operations, and involving known routines and procedures.

Applications may include some complex or non-routine activities involving individual responsibility or autonomy and/or collaboration with others as part of a group or team, and some accountability for the quality of outcomes.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate basic operational knowledge in a moderate range of areas
- apply a defined range of skills
- apply known solutions to a limited range of predictable problems
- perform a range of tasks where choice between a limited range of options is required

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- assess and record information from varied sources
- take limited responsibility for own outputs in work and learning

Electrotechnology Industry Qualifications		
AQF Code	**Certificate II Qualifications**	**Descriptions and Scopes**
UEE20111	Certificate II in Split Air-conditioning and Heat Pump Systems	The installation, commissioning and de-commissioning of single head, split air conditioning and heat pump systems to a prescribed routine where the maximum plant capacity for each system does not exceed 18 kWr. This includes wall hung, floor and ceiling suspended, cassette and ducted fan coil split systems and water heating heat pump systems. This qualification excludes competencies required for service, repair, maintenance, diagnostic/fault finding and electrical work or the safe and proper installation of commercial refrigeration and air conditioning and heat pump plant and equipment. Note: 1. The letter "r" denotes "refrigeration" or cooling capacity, not electrical input power. 2. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 and the Ozone Protection and Synthetic Gas Management Regulations apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.
UEE20411	Certificate II in Winding and Assembly	Wind, place and connect coils for small armatures, transformers and solenoids following prescribed routines
UEE20511	Certificate II in Computer Assembly and Repair	Select components and assemble computer to customer specifications and carry out routine hardware repairs (generally by replacement) of known faulty components following prescribed routines.

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate II Qualifications**	**Descriptions and Scopes**
UEE20711	Certificate II in Data and Voice Communications	Select, assemble, set up and maintain simple equipment and systems to a prescribed routine Certification of telecommunication cabling in buildings and premises. It includes ACMA requirements for Open Cabler Registration.
UEE20811	Certificate II in Electrical Wholesaling	Take and process orders, check and accept stock deliveries, maintain shelf stock and service customers.
UEE20911	Certificate II in Electronic Assembly	Select components, set up and operate component placement machines and carry out rework to a prescribed routine.
UEE21011	Certificate II in Fire Alarms Servicing	Select, assemble and set up of base level fire protection systems in domestic and commercial premises.
UEE21211	Certificate II in Antennae Equipment	Select, assemble, connect and set up TV and radio reception antennae and multiple antenna outlets in buildings and premises
UEE21311	Certificate II in Remote Area Essential Service	Select, assemble, set up and maintain simple equipment and systems following prescribed routines reformat existing units
UEE21411	Certificate II in Remote Area Power Supply Maintenance	Routine maintenance of remote area power supplies consisting of battery banks, generator sets, photovoltaic arrays and wind generators – primarily for use by, but not exclusive to, indigenous communities.
UEE21611	Certificate II in Security Assembly and Setup	Select, assemble and set up of wired and wireless base level security systems following prescribe routines.

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate II Qualifications**	**Descriptions and Scopes**
UEE21711	Certificate II in Technical Support	Collect/receive and store stock at work sites, set up and store equipment and tools, assist in installation, fault finding, maintenance and repair activities.
UEE21911	Certificate II in Electronics	Select, assemble, set up and maintain electronic devices following prescribed routines.
UEE22011	Certificate II in Electrotechnology (Career Start)	Work entry program providing grounding in safety and basic skills and knowledge for work in any Electrotechnology discipline.
UEE22111	Certificate II in Sustainable Energy (Career Start)	Work entry program providing grounding in safety and adopted and emerging sustainable energy systems.

Certificate III

Characteristics of Learning Outcomes

Knowledge and competencies to perform a defined range of skilled operations, within a range of broader related activities and involving known routines, methods and procedures. Performance would occur across a range of roles and in a variety of contexts. Some discretion and judgement would be required in the selection of equipment, services or contingency measures, within known time constraints, and with some complexity in the extent and choice of options available.

Application will involve selecting, adapting and transferring skills and knowledge to new environments and providing technical advice and some leadership in resolution of specified problems.

Applications may involve some responsibility for others. Participation in teams including group or team coordination may be involved.

Distinguishing Features of Learning Outcomes

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Do the competencies enable an individual with this qualification to:

- demonstrate some relevant theoretical knowledge
- apply a range of well developed skills
- apply known solutions to a variety of predictable problems
- perform processes that require a range of well developed skills where some discretion and judgement is required
- interpret available information, using discretion and judgement
- take responsibility for own outputs in work and learning
- take limited responsibility for the output of others

Electrotechnology Industry Qualifications		
AQF Code	**Certificate III Qualifications**	**Descriptions and Scopes**
UEE30111	Certificate III in Business Equipment	Install, set up, test, fault find, repair and maintain photocopiers, fax machines etc
UEE30211	Certificate III in Computer Systems Equipment	Select, install, set up, test, fault find, repair and maintain computer equipment for data storage, personal computer and networks, measurement/analysis and control.
UEE30311	Certificate III in Custom Electronics Installations	Select, install, set up and test surround sound, home theatre and integration aspects for 'intelligent houses'. It covers the scope of CEDIA certification level 2
UEE30411	Certificate III in Data and Voice Communications	Select, install, set up, test, fault find, repair and maintain telecommunications and high performance data services in buildings and premises. It includes ACMA requirements for Open Cabler Registration.

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate III Qualifications**	**Descriptions and Scopes**
UEE30611	Certificate III in Electrical Machine Repair	Motor, transformer and control gear overhaul and repair, including rewinding
UEE30711	Certificate III in Switchgear and Control Gear	Construction, assembly and wiring of switchboards and control panels
UEE30811	Certificate III in Electrotechnology Electrician	Select, install, set up, test, fault find, repair and maintain electrical systems and equipment in building and premises. It includes ERAC requirements for an 'Electrician's licence'.
UEE30911	Certificate III in Electronics and Communications	Select, install, set up, test, fault find, repair and maintain electronic equipment and devices at component/sub-assembly level with options in communications, audio, video and TV, personal computer and networks, security and custom installations
UEE31011	Certificate III in Fire Protection Control	Installation and set up of fire protection systems in multiple, commercial and industrial premises.
UEE31111	Certificate III in Gaming Electronics	Select, install, set up, test, fault find, repair and maintain gaming machines used in registered clubs and hotels and dedicated games machines used in electronic game venues.
UEE31211	Certificate III in Instrumentation and Control	Select, install, set up, test, fault find, repair and maintain systems and devices for measurement and recording of physical/chemical phenomenon and related process control

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate III Qualifications**	**Descriptions and Scopes**
UEE31411	Certificate III in Security Equipment	Installation and pre-commissioning set up of wired and wireless security systems in multiple, commercial industrial premises.
UEE31511	Certificate III in Rail – Communications and Networks	Select, install, commission, fault find and maintain radio and dedicated telecommunications networks in rail equipment.
UEE32011	Certificate III in Renewable Energy - ELV	Select, install, set up, test, fault find, repair and maintain renewable energy equipment and systems. It does not include electrical work covered by licensing requirements declared by the Electrical Regulators Advisory Council (ERAC) for an 'Electrician's licence'.
UEE32111	Certificate III in Appliance Service	Set up, service and repair electrical, and refrigerated appliances with electives in gas appliances Note: The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 may apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.
UEE32211	Certificate III in Air-conditioning and Refrigeration	Select components, install, set up, test, fault find, repair and maintain refrigeration systems and equipment that apply to food storage and preservation and air conditioning and air distribution equipment in buildings and premises. It includes regulatory requirements for purchasing and handling refrigerants.
UEE33011	Certificate III in Electrical Fitting	This qualification provides competencies to manufacture, fit, assemble, erect, operate, test, fault find, alter, repair electrical equipment and includes electrical wiring work only if that work is associated with assembling, maintaining, terminating or altering the wiring between electrical components within a

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate III Qualifications**	**Descriptions and Scopes**
		plant or machinery. An electrical fitter is not authorised to install any electrical wiring systems within an electrical installation as prescribed by definitions contained in AS/NZS 3000. Electrical equipment means any appliance, article, accessory, wire, fitting, cable, conduit or apparatus that generates, uses, conveys or controls (or that is intended to generate, use, convey or control) electricity above extra low voltage.

Certificate IV

Characteristics of Learning Outcomes

Knowledge and competencies covering a broad range of activities performed in a variety of complex and non-routine contexts. Leadership and guidance are involved in organising activities. In the application and planning of the skills and in contributing to technical solutions in non-routine or contingency situations.

Applications will include evaluating and analysing current practices, developing new criteria and procedures for current practices, as well as responsibility for and limited organisation of others.

Distinguishing Features of Learning Outcomes

Do the competencies enable an individual with this qualification to:

- demonstrate understanding of a broad knowledge base incorporating some theoretical concepts
- apply solutions to a defined range of unpredictable problems
- identify and apply skill and knowledge areas to a wide variety of contexts, with depth in some areas
- identify, analyse and evaluate information from a variety of sources

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- take responsibility for own outputs in relation to specified quality standards
- take limited responsibility for the quantity and quality of the output of others

Electrotechnology Industry Qualifications		
AQF Code	**Certificate IV Qualifications**	**Descriptions and Scopes**
UEE40111	Certificate IV in Computer Systems	Select, install, commission, fault find and maintain data processing, communications and control aspects of systems used for monitoring and control of systems for access, surveillance, safety and effective operation of manufacturing, buildings, structures, premises, precincts and personal computer and networks
UEE40211	Certificate IV in Electrical – Data and Voice Communications	Select, install, commission, fault find and maintain electrical and communications systems and equipment in building and premises. It includes ERAC requirements for an 'Electrician's licence' and ACMA requirements for Open Cabler Registration.
UEE40311	Certificate IV in Electrical Installation Inspection and Audits	Mandatory and contractual inspections of electrical systems and auditing of entities for compliance with electrical safety requirements
UEE40411	Certificate IV in Electrical – Instrumentation	Select, install, commission, fault find and maintain electrical and instrumentation equipment in buildings and premises and instrumentation systems and core instrumentation equipment for process and control. It includes ERAC requirements for an 'Electrician's licence'.
UEE40511	Certificate IV in Electrical – Air-conditioning Systems	Select, install, commission, fault find and maintain electrical systems and equipment in buildings and premises and core refrigeration/air conditioning equipment. It includes ERAC requirements for an 'Electrician's licence' and regulatory requirements for purchasing and handling refrigerants.
UEE40611	Certificate IV in	Select, install, commission, fault find and maintain electrical systems and equipment with options,

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate IV Qualifications**	**Descriptions and Scopes**
	Electrotechnology – Systems Electrician	typically in explosion protection; electrical machines; electrical inspection; safety auditing; contracting; lifts; energy supply/distribution
UEE40711	Certificate IV in Electronics and Communications	Select, install, commission, fault find and maintain audio/video and data systems, computer and network hardware, security systems, wireless and communications systems and electronic aspects of medical equipment
UEE40811	Certificate IV in Electrical – Fire Protection Control Systems	Select, install, commission, fault find and maintain fire protection control systems in buildings. It includes ERAC requirements for an 'Electrician's licence'.
UEE40911	Certificate IV in Industrial Electronics and Control	Select, install, commission, fault find and maintain equipment and systems for the control of plant, machines and processes
UEE41011	Certificate IV in Energy Management and Control	This qualification provides competencies to develop strategies for the reduction of energy in buildings and to recommend changes in the way in which energy is controlled in the building either by the installation of new control equipment or by the modification or re-programming of that existing.
UEE41111	Certificate IV in Electrical – Lift Systems	Select, install, commission, fault find and maintain of lifts, escalators and associated equipment. It includes ERAC requirements for an 'Electrician's licence'.
UEE41211	Certificate IV in Electrical – Rail Signalling	Select, install, commission, fault find and maintain rail signalling equipment and systems. It includes ERAC requirements for an 'Electrician's licence'.
UEE41511	Certificate IV in Video and Audio Systems	Service high end audio, video, display systems and HDTV

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate IV Qualifications**	**Descriptions and Scopes**
UEE41611	Certificate IV in Renewable Energy	Select, install, commission, fault find and maintain multiple renewable energy sources and equipment for control of energy use
UEE41711	Certificate IV in Rail – Communications and Network Systems	Select, install, commission, fault find and maintain radio and dedicated telecommunications networks in rail systems
UEE41911	Certificate IV in Electrical – Renewable Energy	Select, install, set up, test, fault find, repair and maintain electrical systems and equipment in buildings and premises. It includes ERAC requirements for an 'Electrician's licence' and competencies to select, install, set up, test, fault find, repair and maintain renewable energy equipment and systems.
UEE42011	Certificate IV in Electrical – Photovoltaic Systems	Select, install, set up, test, fault find, repair and maintain electrical systems and equipment in buildings and premises. It includes ERAC requirements for an 'Electrician's licence' and competencies to select, install, set up, test, fault find, repair and maintain photovoltaic systems and associated equipment
UEE42111	Certificate IV in Electrotechnology – Electrical Contracting	This qualification provides competencies to set up and manage an electrical contracting business. It includes competencies required by regulations for an electrical contracting licence.
UEE42211	Certificate IV in Instrumentation and Control	This qualification provides competencies to select, install, set up, test, fault find, repair, maintain and commission systems and devices for measurement and recording of physical/chemical phenomenon and related process control systems.
UEE42611	Certificate IV in Hazardous	This qualification provides competencies to supervise selection, installation, commissioning

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate IV Qualifications**	**Descriptions and Scopes**
	areas - Electrical	maintenance and testing of explosion-protected equipment and systems for control and monitoring of plant and processes. The qualification provides competencies in working with explosion protections techniques with elections in how they apply to coal mining, gas and dust atmospheres. It includes ERAC requirements for an 'Electrician's licence' and competencies to select, install, set up, test, fault find, repair and maintain stand alone renewable energy equipment and systems.
UEE42711	Certificate IV in Refrigeration and Air-conditioning Servicing	High level fault diagnosis and rectification, commissioning and maintenance of refrigeration systems and equipment that apply to commercial food storage and preservation and air conditioning and air distribution equipment and special applications. It includes regulatory requirements for purchasing and handling refrigerants.
UEE42811	Certificate IV in Air-conditioning Systems Energy Management and Control	This qualification provides competencies to develop strategies for the reduction of energy in buildings and to recommend changes in the way in which energy is controlled in the building either by the installation of new control equipment or by the modification or re-programming of that existing. It includes regulatory requirements for purchasing and handling refrigerants.
UEE42911	Certificate IV in Refrigeration and Air-conditioning Systems	This qualification provides the competencies to determine heat loads and select equipment for basic commercial refrigeration or residential air conditioning applications. It includes regulatory requirements for purchasing and handling refrigerants.
UEE43011	Certificate IV in Electrical Equipment and Systems	This qualification provides competencies to manufacture, fit, assemble, erect, operate, test, fault find, alter, repair electrical equipment and includes electrical wiring work only if that work is associated with assembling, maintaining, terminating or altering the wiring between electrical components within a plant or machinery. An electrical fitter is not authorised to install any electrical wiring systems within an electrical installation as prescribed by definitions contained in AS/NZS 3000.

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Electrotechnology Industry Qualifications		
AQF Code	**Certificate IV Qualifications**	**Descriptions and Scopes**
		Electrical equipment means any appliance, article, accessory, wire, fitting, cable, conduit or apparatus that generates, uses, conveys or controls (or that is intended to generate, use, convey or control) electricity above extra low voltage.
UEE43111	Certificate IV in Energy Efficiency and Assessment	This qualification provides competencies to conduct a residential, office and retail dwellings residential and Small Medium Enterprises (SME) energy audit and to develop energy efficient strategies to reduce an energy use in a range of energy services. The qualification also addresses the environmental and legislative contexts with the fundamental energy audit methodology to develop the initiative and solutions of sustainability and financial viability. The core competencies of this qualification meets the prescribed requirements for ERAC requirements for an ‘Electrician’s licence’.
UEE43211	Certificate IV in Industrial Automation and Control	This qualification provides competencies to assemble, set up and program, fault find, repair and maintain automated equipment, apparatus, associated circuits and systems. It’s includes the supervision of plant maintenance programs and providing technical advice to process staff.

Diploma

Characteristics of Learning Outcomes

Planning and initiating alternative approaches to the application of knowledge and skills across a broad range of contexts/situations, e.g. technical and/or management, evaluation and coordination.

Performance involves self directed application of knowledge and skills, in substantial depth in some areas, and judgement is required in planning

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and selecting appropriate equipment, services and techniques for self and others.

Applications involve participation in development of strategic initiatives as well as personal responsibility and autonomy in performing complex technical operations or organising others. It may involve participation in teams, including teams concerned with planning and evaluation functions. Group or team coordination may be involved.

The degree of emphasis on breadth as against depth of knowledge and skills may vary between qualifications granted at this level.

Distinguishing Features of Learning Outcomes

Do the competencies or learning outcomes enable an individual with this qualification to:

- demonstrate understanding of a broad knowledge base incorporating theoretical concepts, with substantial depth in some areas
- analyse and plan approaches to technical problems or management requirements
- transfer and apply theoretical concepts and/or technical or creative skills to a range of situations
- evaluate information, using it to forecast for planning or research purposes
- take responsibility for own outputs in relation to broad quantity and quality parameters
- take some responsibility for the achievement of group outcomes

Electrotechnology Industry Qualifications

AQF Code	Diploma Qualifications	Descriptions and Scopes
UEE50111	Diploma of Computer Systems Engineering	Develop, select, install, commission and maintain computer equipment, networks and systems
UEE50211	Diploma of Electrical and Instrumentation	Select, install, commission, maintain and diagnose faults/malfunctions on electrical, instrumentation and control equipment and systems. It includes ERAC requirements for an ‘Electrician’s licence’.
UEE50311	Diploma of Electrical and Refrigeration and	Select, install, commission, maintain and diagnose faults/malfunctions on refrigeration systems and equipment that apply to commercial food storage and preservation and air conditioning and air

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Electrotechnology Industry Qualifications		
	Air-conditioning	distribution equipment and special applications and associated electrical systems. It includes ERAC requirements for an 'Electrician's licence' and regulatory requirements for purchasing and handling refrigerants.
UEE50411	Diploma of Electrical Engineering	Develop, select, commission, maintain and diagnose faults/malfunctions on advanced electrical equipment and systems. It includes ERAC requirements for an 'Electrician's licence'.
UEE50511	Diploma of Electronics and Communications Engineering	Develop, select, commission, maintain and diagnose faults/malfunctions of electronic components/sub-assemblies, apparatus and systems
UEE50711	Diploma of Renewable Energy Engineering	Develop, select, commission, maintain and diagnose faults/malfunctions on large scale renewable energy equipment and systems
UEE50811	Diploma of Research and Development	Assist professional in planning, research and development of electrotechnology products and services
UEE50911	Diploma of Industrial Electronics and Control Engineering	Develop, select, commission, maintain and diagnose faults/malfunctions of equipment and systems for the monitoring and control of plant, machines and processes
UEE51011	Diploma of Instrumentation and Control Engineering	This qualification provides competencies to install, set up, test, develop, select, commission, maintain and diagnose faults/malfunctions of equipment and systems for the measurement, recording, monitoring and control of physical/chemical phenomenon and related process control systems.
UEE51111	Diploma of Engineering Technology - Refrigeration and Air-conditioning	This qualification provides enabling competencies to develop systems and select equipment for heating, ventilation, air conditioning and/or refrigeration systems.

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Electrotechnology Industry Qualifications		
UEE51211	Diploma of Air-conditioning and Refrigeration Engineering	Develop systems, select equipment, and commission, maintain and diagnose faults/malfunctions of refrigeration systems and equipment that apply to commercial food storage and preservation and air conditioning and air distribution equipment and special applications. It includes regulatory requirements for purchasing and handling refrigerants.
UEE53011	Diploma in Electrical Equipment and Systems Engineering	This qualification provides competencies to develop, select, commission, maintain and diagnose faults/malfunctions on advanced electrical equipment and systems.

Advanced Diploma

Characteristics of Learning Outcomes

Analysis, design, planning, execution and evaluation across a range of technical and/or management functions, including development of new criteria or applications or knowledge or procedures.

The application of a significant range of fundamental principles and complex techniques across a wise and often unpredictable variety of contexts in relation to either varied or highly specific functions. Contribution to the development of a broad plan, budget or strategy is involved and accountability and responsibility for self and others in achieving the outcomes is involved.

Applications involve significant judgement in planning, design, technical or leadership/guidance functions related to products, services, operations or procedures.

The degree of emphasis on breadth as against depth of knowledge and skills may vary between qualifications granted at this level.

Distinguishing Features of Learning Outcomes

Do the competencies or learning outcomes enable an individual with this qualification to:

- demonstrate understanding of specialised knowledge with depth in some areas

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- analyse, diagnose, design and execute judgements across a broad range of technical or management functions
- generate ideas through the analysis of information and concepts at an abstract level
- demonstrate a command of wide ranging, highly specialised technical, creative or conceptual skills
- demonstrate accountability for personal outputs within broad parameters
- demonstrate accountability for personal and group outcomes within broad parameters

Electrotechnology Industry Qualifications

AQF Code	Advanced Diploma Qualifications	Descriptions and Scopes
UEE60211	Advanced Diploma of Electronics and Communications Engineering	Design and validate/evaluate electronics and communications equipment and systems, computer and network based systems, manage risk, estimate and manage projects and provide technical advice/sales
UEE60411	Advanced Diploma of Computer Systems Engineering	Design, install/validate/evaluate and administer computer networks and systems, manage risk, estimate and manage projects and provide technical advice/sales.
UEE60611	Advanced Diploma of Industrial Electronics and Control Engineering	Design and validate/evaluate control equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales.
UEE60911	Advanced Diploma of Renewable Energy Engineering	Design and validate/evaluate renewable energy equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales.
UEE61111	Advanced Diploma of Automated Systems Maintenance Engineering	Monitor/validate/evaluate automated equipment and systems, manage risk, develop and manage maintenance programs, and provide technical advice

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Electrotechnology Industry Qualifications		
AQF Code	**Advanced Diploma Qualifications**	**Descriptions and Scopes**
UEE61211	Advanced Diploma of Engineering – Explosion protection	Design and validate/evaluate electrical or control equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales. It includes competencies in explosion-protection necessary for areas where flammable materials are present.
UEE61511	Advanced Diploma of Instrumentation and Control Engineering	This qualification provides competencies to design and validate/evaluate process control equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales. It's also provides competencies to install, set up, test, develop, select, commission, maintain, diagnose faults/malfunctions of equipment and systems
UEE61711	Advanced Diploma of Engineering Technology - Electronic	Prepare to design and validate/evaluate electronics and communication equipment and systems and provide technical advice/sales.
UEE61811	Advanced Diploma of Engineering Technology - Computer Systems	Prepare to design, install/validate/evaluate and administer computer networks and systems and provide technical advice/sales.
UEE62011	Advanced Diploma of Engineering Technology - Renewable Energy	Prepare to design and validate/evaluate renewable energy equipment and systems and provide technical advice/sales
UEE62111	Advanced Diploma of Engineering Technology - Electrical	Prepare to design and validate/evaluate electrical equipment and systems and provide technical advice/sales.
UEE62211	Advanced Diploma of Electrical	This qualification provides competencies to design and validate/evaluate electrical equipment and

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Electrotechnology Industry Qualifications		
AQF Code	**Advanced Diploma Qualifications**	**Descriptions and Scopes**
	– Engineering	systems, manage risk, estimate and manage projects and provide technical advice/sales. It develops competencies in the ethical and responsible application of mathematics, science, engineering techniques, Standards and Codes of Practice, engineering design practices, supervision and management of physical, human and financial resources in engineering. The core competencies of this qualification meet the prescribed requirements for Engineering Associate membership of Engineers Australia and ERAC requirements for an 'Electrician's licence'. Participants seeking Engineers Australia membership should ensure that their training provider is accredited by that body to provide Engineering Education Programs at the level of Engineering Associate
UEE62311	Advanced Diploma of Electrical Engineering – Coal Mining	This qualification provides competencies to design and validate/evaluate coal mining electrical equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales. It develops competencies in the ethical and responsible application of mathematics, science, engineering techniques, Standards and Codes of Practice, engineering design practices, supervision and management of physical, human and financial resources in engineering. The core competencies of this qualification meets the prescribed requirements for Engineering Associate membership of Engineers Australia and ERAC requirements for an 'Electrician's licence. Participants seeking Engineers Australia membership should ensure that their training provider is accredited by that body to provide Engineering Education Programs at the level of Engineering Associate

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Electrotechnology Industry Qualifications		
AQF Code	**Advanced Diploma Qualifications**	**Descriptions and Scopes**
UEE62411	Advanced Diploma of Engineering Technology - Air-conditioning and Refrigeration	Prepare to design and validate/evaluate refrigeration and air conditioning equipment and systems and provide technical advice/sales
UEE62511	Advanced Diploma of Air-conditioning and Refrigeration Engineering	Design and validate/evaluate refrigeration and air conditioning equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales. It includes regulatory requirements for purchasing and handling refrigerants. It develops competencies in the ethical and responsible application of mathematics, science, engineering techniques, Standards and Codes of Practice, engineering design practices, supervision and management of physical, human and financial resources in Refrigeration and Air Conditioning engineering. It includes regulatory requirements for purchasing and handling refrigerants. The core competencies of this qualification meet the prescribed requirements for Engineering Associate membership of Engineers Australia. Participants seeking Engineers Australia membership should ensure that their training provider is accredited by that body to provide Engineering Education Programs at the level of Engineering Associate.
UEE63011	Advanced Diploma in Electrical Systems Engineering	This qualification provides competencies to develop, design and validate/evaluate, select, commission, maintain and diagnose faults/malfunctions on advanced electrical equipment and systems. Also, provides skills to manage risk, estimate and manage projects and provide technical advice/sales. It develops competencies in the ethical and responsible application of mathematics, science,

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Electrotechnology Industry Qualifications		
AQF Code	**Advanced Diploma Qualifications**	**Descriptions and Scopes**
		engineering techniques, Standards and Codes of Practice, engineering design practices, supervision and management of physical, human and financial resources in engineering.

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1.1.05 Qualifications and Packaging Rules

1.5 Qualifications and Packaging Rules

The following table details the full range of qualifications in this version of the Electrotechnology Training Package, the completion requirements for each qualification and their respective structure and composition. These qualifications have been designed to comply with the National Quality Council's Packing Rules for Flexibility initiative.

Each qualification is described by the number of core and elective weighted points required for completion and issue of the qualification under the AQF.

Respective qualifications have at least two Elective Groups from which elective competencies may be drawn. Where a range of weighting points is set for a group e.g. 60-120, the lower number indicates both the minimum weighting points required from that particular elective group for completion and the larger number is the maximum required weighting points which may be selected from that group for a valid qualification completion.

Where the lower number for a group is 0 no competencies are required to be selected from that group, however, sufficient weighted points must be selected from other groups to meet the required total elective weighted points for completion.

Note: Individuals may select elective units to a weighting point total greater than the maximum specified for completion from a particular group. Where this is done weighted points in excess of the specified maximum cannot be counted for completion of the qualification.

Where a Competency Standard Unit has pre-requisite Competency Standards Unit requirements, such pre-requisite units shall be completed and their weighted points counted toward qualification completion.

Full details of each qualification follow Table 1 -Qualification Completion Values, below.

Table 1 -Qualification Completion Values

Qualification Code	Qualification Title	Total Core	Total Elective	Elective Units Groups					Packaging Forumla		
				Group A	Group B	Group C	Group D	Group E	Electives	Imported	Regulated

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UEE10111	Certificate I in ElectroComms Skills	120	60	0-30	30-60				33%	17%	
UEE20111	Certificate II in Split Air-conditioning and Heat Pumps Systems	340	20	0-20	0-20				6%	6%	Yes
UEE20411	Certificate II in Winding and Assembly	200	160	0-60	100-160				44%	17%	
UEE20511	Certificate II in Computer Assembly and Repair	200	160	0-60	100-160				44%	17%	
UEE20711	Certificate II in Data and Voice Communications	380	40	0-20	20-40				10%	5%	Yes
UEE20811	Certificate II in Electrical Wholesaling	160	200	0-60	140-200				56%	17%	
UEE20911	Certificate II in Electronic Assembly	220	140	0-60	80-140				39%	17%	
UEE21011	Certificate II in Fire Alarms Servicing	220	140	0-60	80-140				39%	17%	
UEE21211	Certificate II in Antennae Equipment	240	120	0-60	60-120				33%	17%	
UEE21311	Certificate II in Remote Area Essential Service	160	200	0-160	40-200				56%	44%	

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UEE21411	Certificate II in Remote Area Power Supply Maintenance	200	160	0-60	100-160				44%	17%	
UEE21611	Certificate II in Security Assembly and Set-up	240	120	0-60	60-120				33%	17%	
UEE21711	Certificate II in Technical Support	200	160	0-60	100-160				44%	17%	
UEE21911	Certificate II in Electronics	240	120	0-60	60-120				33%	17%	
UEE22011	Certificate II in Electrotechnology (Career Start)	220	140	0-60	80-140				39%	17%	
UEE22111	Certificate II in Sustainable Energy (Career Start)	200	160	0-60	100-160				44%	17%	
UEE30111	Certificate III in Business Equipment	700	360	0-180	180-360				34%	17%	
UEE30211	Certificate III in Computer Systems Equipment	560	500	0-150	350-500				47%	14%	
UEE30311	Certificate III in Custom Electronics Installations	600	460	0-150	310-460				43%	14%	
UEE30411	Certificate III in Data and Voice Communications	740	320	0-100	220-320				30%	9%	Yes

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UEE30611	Certificate III in Electrical Machine Repair	880	180	0-60	120-180				17%	6%	Yes
UEE30711	Certificate III in Switchgear and Controlgear	900	160	0-60	180-160				26%	6%	Yes
UEE30811	Certificate III in Electrotechnology Electrician	920	140	0-60	80-140				13%	6%	Yes
UEE30911	Certificate III in Electronics and Communications	680	380	0-180	200-380				36%	17%	
UEE31011	Certificate III in Fire Protection Control	690	370	0-170	200-370				35%	16%	Yes
UEE31111	Certificate III in Gaming Electronics	700	360	0-160	200-360				34%	15%	Yes
UEE31211	Certificate III in Instrumentation and Control	920	140	0-60	80-140				13%	6%	Yes
UEE31411	Certificate III in Security Equipment	640	420	0-170	250-420				40%	16%	
UEE31511	Certificate III in Rail – Communications and Networks	680	380	0-170	210-380				36%	16%	
UEE32011	Certificate III in Renewable Energy - ELV	700	360	0-170	190-360				34%	16%	

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UEE32111	Certificate III in Appliance Service	840	220	0-100	120-220				21%	9%	Yes
UEE32211	Certificate III in Air-conditioning and Refrigeration	1000	60	0-30	30-60				6%	3%	Yes
UEE33011	Certificate III in Electrical Fitting	820	240	0-60	180-240				23%	6%	Yes
UEE40111	Certificate IV in Computer Systems	600	680	0-220	0-500	180-680			53%	17%	
UEE40211	Certificate IV in Electrical – Data and Voice Communications	1120	160	0-80	0-80	80-160			13%	6%	Yes
UEE40311	Certificate IV in Installation Inspection and Audits	1060	220	0-80	0-110	110-220			17%	6%	Yes
UEE40411	Certificate IV in Electrical – Instrumentation	1160	120	0-60	0-60	60-120			9%	5%	Yes
UEE40511	Certificate IV in Electrical – Air-conditioning Split Systems	1120	160	0-80	0-80	80-160			13%	6%	Yes
UEE40611	Certificate IV in Electrotechnology – Systems Electrician	960	320	0-100	0-100	220-320			25%	8%	Yes

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UEE40711	Certificate IV in Electronics and Communications	720	560	0-220	0-360	200-560			44%	17%	
UEE40811	Certificate IV in Electrical – Fire Protection Control Systems	1180	100	0-60	0-60	40-100			8%	5%	Yes
UEE40911	Certificate IV in Industrial Electronics and Control	1080	200	0-100	0-100	100-200			16%	8%	Yes
UEE41011	Certificate IV in Energy Management and Control	980	300	0-100	0-100	200-300			23%	8%	Yes
UEE41111	Certificate IV in Electrical – Lift Systems	1200	80	0-20	0-20	60-60			6%	2%	Yes
UEE41211	Certificate IV in Electrical – Rail Signalling	1280	70	0-30	0-40	30-70			5%	2%	Yes
UEE41511	Certificate IV in Video and Audio Systems	840	440	0-220	0-220	220-440			34%	17%	
UEE41611	Certificate IV in Renewable Energy	740	540	0-220	0-320	220-380			42%	17%	
UEE41711	Certificate IV in Rail – Communications and Network Systems	720	560	0-220	0-340	220-560			44%	17%	
UEE41911	Certificate IV in Electrical –	1120	160	0-50	0-120	40-160			13%	4%	Yes

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	Renewable Energy										
UEE42011	Certificate IV in Electrical – Photovoltaic systems	1100	180	0-90	0-90	90-180			14%	7%	Yes
UEE42111	Certificate IV in Electrotechnology – Electrical Contracting	1040	240	0-120	0-120	120-240			19%	9%	Yes
UEE42211	Certificate IV in Instrumentation and Control	1080	200	0-60	0-100	100-200			16%	5%	Yes
UEE42611	Certificate IV in Hazardous areas - Electrical	980	300	0-60	0-80	220-300			23%	5%	Yes
UEE42711	Certificate IV in Air-conditioning and Refrigeration Servicing	1100	180	0-90	0-90	90-180			14%	7%	Yes
UEE42811	Certificate IV in Air-conditioning Systems Energy Management and Control	1120	160	0-80	0-80	80-160			13%	6%	Yes
UEE42911	Certificate IV in Refrigeration and Air-conditioning Systems	1230	50	0-20	0-30	20-50			4%	2%	Yes
UEE43011	Certificate IV in Electrical Equipment and Systems	860	420	0-60	0-200	220-420			33%	5%	Yes
UEE43111	Certificate IV in Energy	1020	260	0-120	0-120	140-260			20%	9%	Yes

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	Efficiency and Assessment										
UEE43211	Certificate IV in Industrial Automation and Control	520	760	0-220	0-540	220-760			59%	17%	
UEE50111	Diploma of Computer Systems Engineering	140	1460	0-270	0-880	0-580	580-1040		91%	17%	
UEE50211	Diploma of Electrical and Instrumentation	1520	80	0-20	0-20	0-20	60-80		5%	1%	Yes
UEE50311	Diploma of Electrical and Refrigeration and Air-conditioning	1620	80	0-20	0-20	0-20	40-60		5%	1%	Yes
UEE50411	Diploma of Electrical Engineering	1000	600	0-270	0-100	0-240	260-600		38%	17%	Yes
UEE50511	Diploma of Electronics and Communications Engineering	140	1460	0-270	0-920	260-580	280-1200		91%	17%	
UEE50711	Diploma of Renewable Energy Engineering	1080	520	0-260	0-100	0-240	260-340		33%	16%	Yes
UEE50811	Diploma of Research and Development	720	880	0-270	0-500	0-240	140-240		55%	17%	
UEE50911	Diploma of Industrial Electronics and Control Engineering	1120	480	0-220	0-100	0-120	260-480		30%	14%	Yes

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UEE51011	Diploma of Instrumentation and Control Engineering	1120	480	0-180	0-100	0-120	260-480		30%	11%	Yes
UEE51111	Diploma of Engineering Technology - Refrigeration and Air-conditioning	920	680	0-270	0-100	60-170	270-620		43%	17%	
UEE51211	Diploma of Air-conditioning and Refrigeration Engineering	1470	130	0-60	0-30	0-50	50-130		8%	4%	Yes
UEE53011	Diploma of Electrical Systems Engineering	960	640	0-270	0-140	0-240	260-640		40%	17%	Yes
UEE60211	Advanced Diploma of Electronics and Communications Engineering	280	1880	0-360	0-900	0-280	0-260	520-1320	87%	17%	
UEE60411	Advanced Diploma of Computer Systems Engineering	280	1880	0-360	0-900	0-280	0-280	420-1600	87%	17%	
UEE60611	Advanced Diploma of Industrial Electronics and Control Engineering	1800	360	0-180	0-60	0-100	0-60	160-360	17%	8%	Yes
UEE60911	Advanced Diploma of Renewable Energy Engineering	1820	340	0-170	0-60	0-100	0-60	160-340	16%	8%	Yes
UEE61111	Advanced Diploma of Automated Systems	1120	1040	0-360	0-280	0-220	0-220	320-1040	48%	17%	

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	Maintenance Engineering										
UEE61211	Advanced Diploma of Engineering – Explosion protection	1780	380	0-170	0-60	0-80	0-60	160-380	18%	8%	Yes
UEE61511	Advanced Diploma of Instrumentation and Control Engineering	1740	420	0-170	0-80	0-80	0-80	180-420	19%	8%	Yes
UEE61711	Advanced Diploma of Engineering Technology - Electronics	1160	1000	0-360	0-200	0-200	0-300	280-1000	46%	17%	
UEE61811	Advanced Diploma of Engineering Technology - Computer Systems	1160	1000	0-360	0-200	0-200	0-300	280-1000	46%	17%	
UEE62011	Advanced Diploma of Engineering Technology - Renewable Energy	1260	900	0-360	0-240	0-220	0-220	280-320	42%	17%	
UEE62111	Advanced Diploma of Engineering Technology - Electrical	1440	720	0-360	0-160	0-220	0-220	200-720	33%	17%	
UEE62211	Advanced Diploma of Electrical - Engineering	1680	480	0-220	0-60	0-100	0-60	260-480	22%	10%	Yes
UEE62311	Advanced Diploma of Electrical Engineering – Coal	1840	320	0-160	0-60	0-100	0-60	160-320	15%	7%	Yes

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	Mining										
UEE62411	Advanced Diploma of Engineering Technology - Air-conditioning and Refrigeration	1360	800	0-350	0-100	120-320	200-360	360-480	37%	16%	
UEE62511	Advanced Diploma of Air-conditioning and Refrigeration Engineering	1910	250	0-120	0-30	0-60	0-120	120-250	12%	6%	Yes
UEE63011	Advanced Diploma of Electrical Systems Engineering	1580	580	0-220	0-160	0-160	0-160	200-580	27%	10%	Yes

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1.1.06 Skill Sets

1.6 Skill Sets

Definition

Skill sets are defined as single units of competency, or combinations of units of competency from an endorsed Training Package, which link to a licence or regulatory requirement, or defined industry need.
Skill sets are a way of publicly identifying logical groupings of units of competency which meet an identified need or industry outcome. Skill sets are not qualifications.
Where skill sets are identified in a Training Package, the Statement of Attainment can set out the competencies a person has achieved in a way that is consistent and clear for employers and others. This is done by including the wording 'these competencies meet [insert skill set title or identified industry area] need' on the Statement of Attainment. This wording applies only to skill sets that are formally identified as such in the endorsed Training Package. See the 2011 edition of the AQF Implementation Handbook for advice on wording on Statements of Attainment. See:
http://www.aqf.edu.au/Portals/0/Documents/Handbook/AQF_Handbook_07.pdf

Identified Skill Sets

1.2.01 Competency Standards

Volume 1 Part 2

2.1 Competency Standards

This section explains competency, how competency standards are developed and the industry coverage they can apply to, and the format and construction of individual competency standard units.

What is competency?

A competency comprises the specification of knowledge and skill and the application of that knowledge and skill to the standard of performance required in the workplace. This definition of competency standard includes:

- what is expected of an employee in the workplace rather than on the learning process which embodies the ability to transfer and apply skills and knowledge to new situations and environments
- an emphasis on outcomes and on the application of skills and knowledge, not just specification
- what people are able to do and their ability to do it in a range of contexts, e.g. maintain and use networks of suppliers, government agencies.

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The broad concept of industry competency concerns the ability to perform particular tasks and duties to the standard of performance expected in the workplace. Competency requires the application of specified skills and knowledge and attitudes relevant to effective participation in an industry, industry sector or enterprise.
Competency covers all aspects of workplace performance and involves performing individual tasks; managing a range of different tasks; responding to contingencies or breakdowns; and dealing with the responsibilities of the workplace, including working with others. Workplace competency requires the ability to apply relevant skills, knowledge and attitudes consistently over time and in the required workplace situations and environments. In line with this concept of competency, Training Packages focus on what is expected of a competent individual in the workplace as an outcome of learning, rather than focussing on the learning process itself.
Competency standards in Training Packages are determined by industry to meet identified industry skill needs. Competency standards are made up of a number of units of competency each of which describes a key function or role in a particular job function or occupation.
Each unit of competency within a Training Package is linked to one or more AQF qualifications.

1.2.02 Contextualisation of Competency Standard Units by RTOs

2.2 Contextualisation of Competency Standard Units by RTOs

Registered Training Organisations (RTOs) may contextualise units of competency to reflect local outcomes provided that no requirements and/or completion rules of the Training Package are infringed. This includes any prevailing regulatory requirements that may apply to the competency standard units. Contextualisation, provided it does not dilute in any way the units of competency, could involve additions or amendments to the unit of competency to suit particular delivery methods, learner profiles, specific enterprise equipment requirements, or to otherwise meet local needs. However, the integrity of the overall intended outcome of the unit of competency must be maintained.
Any contextualisation of units of competency in this endorsed Training Package must be within the bounds of the following advice. In contextualising competency standard units, RTOs:

- must not contravene, diminish or detract from any regulatory/licensing arrangement that may apply to the unit, or its related delivery arrangements
- must not remove or add to the number and content of Elements and Performance Criteria
- may add specific industry terminology to Performance Criteria where this does not distort or narrow the competency outcomes
- may make amendments and additions to the Range Statement as long as such changes do not diminish the breadth of application of the competency or reduce its portability
- may add detail to the Evidence Guide in areas such as the critical aspects of evidence or resources and infrastructure required where these expand the breadth of the competency but do not limit its use.

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1.2.03 Components of Units of Competency

2.3 Components of Units of Competency

The components of units of competency are summarised below, in the order in which they appear in each unit of competency:

Unit Title

The unit title is a succinct statement of the outcome of the competency standard unit. Each unit title is unique, both within and across Training Packages.

Unit Descriptor

The scope/descriptor broadly communicates the content and purpose of the competency standard unit and the skill area it addresses. Where units have been contextualised from competency standard units in other endorsed Training Package, summary information is provided.

Employability Skills

This sub-section contains a statement that the unit contains Employability skills.

Prerequisite Competencies and Literacy and Numeracy (optional)

If there are any competency standard units that must be completed before or concurrently, these will be listed. In addition, there may be a sub-section on entry advice related to levels of language and numeracy applicable to the unit.

Application of the Unit

This sub-section fleshes out the scope and purpose of the competency standard, and its operation in different contexts, e.g. showing how it applies in the workplace. It may include a sub-section or second paragraph that describes its relationship with other industry sectors and any licensing application or requirements, such as a licence to practice.

Competency Field (Optional)

The competency field either reflects the way the competency standard units are categorised in the Training Package or denotes the industry sector, specialisation or function. It is an optional component of the competency standard unit.

Sector (optional)

The industry sector is a further categorisation of the competency field and identifies the next classification, for example an elective or supervision field.

Elements of Competency

The elements of competency are the basic building blocks of the competency standard unit. They describe, in terms of outcomes, the significant functions and tasks that make up the competency.

Performance Criteria

The Performance Criteria specify the required performance in relevant tasks, roles, processes, skills and in the applied knowledge that enables competent performance. They are usually written in passive voice. Critical terms or phrases may be written in bold italics and then defined in the Range Statement, in the order of their appearance in the Performance Criteria.

Required Essential Knowledge and Associated Skills

In the competency standard units, essential knowledge and associated skills (EKAS) may be identified separately or combined. Knowledge identifies what a person needs to know to perform the work in an informed and effective manner. Skills describe the application of knowledge to situations where understanding is converted into a workplace outcome and includes the ability to transfer it to new situations and environments.

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In this Training Package essential knowledge and associated skills (EKAS) have been separated from the competency standard units to facilitate user-friendliness for interpretation, applicability and future maintenance. Within the EKAS section of each unit clause numbers and titles refer learners to the relevant EKAS details in the separate section in Volume 2. All assessment evidence activities and reporting processes shall include and confirm achievement of the relevant EKAS specification(s).

Range Statement

The Range Statement provides a context for the competency standard unit describing essential operating conditions for training and assessment related to; the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts. The meanings of key terms used in the Performance Criteria are also explained in the Range Statement.

Evidence Guide

The evidence guide is an integral part of the competency standard unit as it provides the assessment information to the RTO assessors about the critical aspects and how the competency may be demonstrated. The evidence guide does this by providing a range of evidence for the assessor to use in making determinations and by providing the assessment context. The evidence guide describes:

- conditions under which competency must be assessed, including variables such as the assessment environment or necessary equipment
- relationships with the assessment of any other competency standard units
- suitable methodologies for conducting assessment, including the potential for workplace simulation
- resource implications, e.g. access to particular equipment, infrastructure or situations
- how consistency in performance can be assessed over time, various contexts and with a range of evidence
- the required critical aspects and underpinning knowledge and skills
- application against relevant legislation, regulation, industrial instruments, codes of practice, guidelines and advisory standards. This also includes anti-discrimination and equal employment opportunity statutes (encompassing application of access, equity and cultural diversity principles associated with under-represented groups).

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1.2.04 Employability Skills in Units of Competency

2.4 Employability Skills in Units of Competency

The detail and application of Employability Skills facets will vary according to the job-role requirements of each industry. In developing Training Packages, industry stakeholders are consulted to identify appropriate facets of Employability Skills which are incorporated into the relevant units of competency and qualifications.

Employability Skills are not a discrete requirement contained in units of competency (as was the case with Key Competencies). Employability Skills are specifically expressed in the context of the work outcomes described in units of competency and will appear in elements, performance criteria, range statements and evidence guides. As a result, users of Training Packages are required to review the entire unit of competency in order to accurately determine Employability Skills requirements.

How Employability Skills relate to the Key Competencies

The eight nationally agreed Employability Skills now replace the seven Key Competencies in Training Packages. Trainers and assessors who have used Training Packages prior to the introduction of Employability Skills may find the following comparison useful.

Employability Skills	Mayer Key Competencies
Communication	Communicating ideas and information
Teamwork	Working with others and in teams
Problem solving	Solving problems Using mathematical ideas and techniques
Initiative and enterprise	
Planning and organising	Collecting, analysing and organising information Planning and organising activities
Self-management	
Learning	
Technology	Using technology

When analysing the above table it is important to consider the relationship and natural overlap of Employability Skills. For example, using technology may involve communication skills and combine the understanding of mathematical concepts.

Explicitly embedding Employability Skills in units of competency

This Training Package seeks to ensure that industry-endorsed Employability Skills are explicitly embedded in units of competency. The application of each skill and the level of detail included in each part of the unit will vary according to industry requirements and the nature of the unit of competency.

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Employability Skills must be both explicit and embedded within units of competency. This means that Employability Skills will be:

- embedded in units of competency as part of the other performance requirements that make up the competency as a whole
- explicitly described within units of competency to enable Training Packages users to identify accurately the performance requirements of each unit with regards to Employability Skills.

This Training Package also seeks to ensure that Employability Skills are well-defined and written into units of competency so that they are apparent, clear and can be delivered and assessed asan essential component of unit work outcomes.

Sample unit of competency components showing Employability Skills
The following table shows the sequence of a unit of competency, and each cell contains text taken from a range of units. It provides examples of where and how various Employability Skills could be embedded in each component.
Please note that in the example, the bracketed Employability Skills are provided for clarification only and would not be present in units of competency within this Training Package.

Unit Title	Give formal presentations and take part in meetings (**Communication**)
Unit Descriptor	This unit covers the skills and knowledge required to promote the use and implementation of innovative work practices to effect change. (**Initiative and enterprise**)
Element	Proactively resolve issues. (**problem solving**)
Performance Criteria	Information is organised in a format suitable for analysis and dissemination in accordance with organisational requirements. (**Planning and organising**)
Range Statement	Software applications may include email, internet, word processing, spreadsheet, database or accounting packages. (**technology**)
	Modify activities depending on differing workplace contexts, risk situations and environments. (**Learning**)
Required Skills and Knowledge	Work collaboratively with others during a fire emergency. (teamwork)
	Instructions, procedures and other information relevant the maintenance of vessel and port security. (**Communication**)
Evidence Guide	Evidence of having worked constructively with a wide range of community groups and stakeholders to solve problems and adapt or design new solutions to meet identified needs in crime prevention. In particular, evidence must be obtained on the ability to:

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- assess response options to identified crime-prevention needs and determine the optimal action to be implemented
- in consultation with relevant others, design an initiative to address identified issues. (**Initiative and enterprise**).

How Employability Skills relate to the Key Competencies
The eight nationally agreed Employability Skills now replace the seven Key Competencies in Training Packages. Trainers and assessors who have used Training Packages prior to the introduction of Employability Skills may find the following comparison useful.

Employability Skills	Mayer Key Competencies
Communication	Communicating ideas and information
Teamwork	Working with others and in teams
Problem solving	Solving problems Using mathematical ideas and techniques
Initiative and enterprise	
Planning and organising	Collecting, analysing and organising information Planning and organising activities
Self-management	
Learning	
Technology	Using technology

When analysing the above table it is important to consider the relationship and natural overlap of Employability Skills. For example, using technology may involve communication skills and combine the understanding of mathematical concepts.
Explicitly embedding Employability Skills in units of competency
This Training Package seeks to ensure that industry-endorsed Employability Skills are explicitly embedded in units of competency. The application of each skill and the level of detail included in each part of the unit will vary according to industry requirements and the nature of the unit of competency.
Employability Skills must be both explicit and embedded within units of competency. This means that Employability Skills will be:

- embedded in units of competency as part of the other performance requirements that make up the competency as a whole
- explicitly described within units of competency to enable Training Packages users to identify accurately the performance requirements of each unit with regards to Employability Skills.

This Training Package also seeks to ensure that Employability Skills are well-defined and written into units of competency so that they are apparent, clear and can be delivered and assessed as an essential component of unit work outcomes.

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Employability Skills Summaries and Units of Competency

An Employability Skills Summary exists for each qualification. Summaries include broad advice on industry expectations with regard to Employability Skills at the qualification level. Summaries should be used by trainers and assessors to assist in identifying the Employability Skills requirements contained within units of competency.
Please refer to Volume 1 Part 1 Qualification Framework for the relevant Employability Skill Summary for qualifications in this Training Package

1.2.05 Competency Standards for the Electrotechnology Industry

2.5 Competency Standards for the Electrotechnology Industry

The first competency standards for the function of Electrotechnology were developed and endorsed in 1992, by the then National Training Board (NTB). These 1992 version competency standard units were updated into Draft Generic Electrotechnology Competency Standards prior to 1998 and provided the basis for developing the Electrotechnology Training Package which was endorsed in 1999 as UTE99. Subsequent minor amendments were made to include an array of qualifications, variations to competency standard units and the inclusion of a range of new technologies and sectors.
The revised units in this Training Package cover the broad range of knowledge and skills applied in the Electrotechnology Industry. The development project satisfied the following characteristics:

- Development, consultation, and validation included appropriate processes with a wide range of industry employer/employee, practitioners, providers, stakeholders/community, and regulatory and government agency representatives.
- The draft standards were distributed throughout the national, State and Territory ITAB network and to industry stakeholders for feedback. Feedback from other industries was also actively encouraged.

During the development process, the ElectroComms and EnergyUtilities Industry Skills Council (formerly the National Utilities and Electrotechnology ITAB), trading as E-OZ Energy Skills Australia and its nationwide focus groups were appropriately representative of the industry, throughout Australia.

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1.2.06 Competency Standard Units for the Electrotechnology Industry

2.6 Competency Standard Units for the Electrotechnology Industry

The competency standard units in this Training Package include:
National Electrotechnology Industry (UEE) units
Imported units from other endorsed Training Packages that have been valued by the National Electrotechnology Competency Advisory Council (NECAC) for inclusion in Qualifications in this Training Package.
Competency standard units provide specifications of work performance. The Australian Standard Classifications of Occupation (ASCO) defines a number of occupations served by this Training Package. See 'Preliminary Information' in this Volume. Most vocations in this group have an entry level of skill commensurate with an AQF Certificate III or higher qualification. In some instances relevant experience is required in addition to a formal qualification.
A large body of the skills and knowledge detailed in the competencies within this Training Package generally reside within the family of Electrotechnology vocations classified and grouped as occupations under ASCO (Australian Standards Classification of Occupation Code) by the Australian Bureau of Statistics (ABS). In addition to an array of units used as Possible Skills Sets, each competency standard unit is linked to one or more AQF qualifications.

Unit construction

Within the national training framework, competency standard units are the smallest component of achievement that is nationally recognised, i.e. the unit as a whole is recognised not individual elements or Performance Criteria within the unit.
The competency standard units in this Training Package have been developed in accordance with the DOI standardised format.
Each unit has a unique title, relates to an industry context, and conforms to national coding requirements. Issues considered in constructing competency standard units in this Training Package include breadth, size, transferability and the interrelationships between units. The relationship with any prevailing regulatory requirements and regimes is included in the unit where appropriate.
Competency standard units provide the basis for:

- recognition of skills within and across industries
- work organisation reviews and options
- development of training
- assessment
- certification
- credit transfer and articulation.

Some competency standard units have been constructed to allow reporting of additional information, generally in relation to a specific context and would be in the form of an *endorsement*.

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An *Endorsement* is a statement recognising the high degree of commonality (in process or function) in Elements and Performance Criteria of the unit when applied across the industry irrespective of the required technical knowledge. *Endorsements* are a way of including information in the Evidence Guide of the unit that relates to a particular application and/or vocational outcome. This type of unit might be seen as several units in one, that is a unit with five *Endorsements* has five specific outcomes. Additional information is contained in the relevant units.

In units that include *endorsements*, all aspects of a selected *endorsement* must be completed to attain formal recognition of a specific outcome.

In cases where units contain *endorsements* they should be interpreted in the context of the qualification which requires the nomination of an *endorsement* as detailed in Volume 1 Part 1 – Qualifications Framework,.

Employability Skills

A new feature included in the competency standard units of this Training Package is the inclusion of Employability Skills, i.e. that enable employees to develop and use 'real life' skills and experiences in work, e.g. for self-learning, for reflecting on performance, for interpreting the workplace, in planning and organising work, and in responding to new situations that are non-routine.

Employability Skills apply to work in general as enabling skills, rather than to particular occupations or industries. They focus on the enabling qualities of knowledge and skills as they are applied in an integrated way in workplace situations.

Contextualisation

In some competency standard units 'notes' have been attached to specific content to add value and clarity. The notes augment one or more of the following; Scope, Performance Criteria, Range Statement, Essential Knowledge and Associated Skills or other related sections. The insertion of these 'notes' is primarily to provide users and support material developers with additional guidance as to the range and depth so as to achieve acceptable consistency between deliverers and assessors.

As the type, form, process, technique, technology or equipment may change over time it is the RTOs responsibility to remain current in their delivery and assessment arrangements and reference to the notes will assist in this regard.

In these instances RTOs should aim to accommodate the change by varying the context of the examples given in the 'Notes'. However, the variation must not alter the intended outcome of the competency standard units in any way.

Where contextualisation of the notes varies the outcome of the competency standard units and its related content, RTOs should consult with E-Oz Energy Skills Australia to explore options for incorporating and/or covering the new arrangements, so that currency of the Training Package is maintained.

It should be noted that any need to alter the competency standard units from the intended outcomes requires a new or varied competency standard unit. Such changes are to be undertaken through the continuous improvement processes required of Training Packages, which in relation to this Training Package is managed by E-Oz Energy Skills Australia.

Also refer to Volume 1 Part 1 – Qualifications Framework, of this Electrotechnology Training Package that describes vocational standards for the Industry.

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Prerequisites

It is important to note that training delivery of prerequisite competency standard units may be concurrent with the delivery of the unit calling up the prerequisite. However, the final assessment event and the deeming of competence are to follow the prerequisite sequence.

Assessment guidelines

The Electrotechnology Industry has developed guidelines for the assessment of these competency standards. Assessment guidelines are included at Volume 1 Part 3 of this Training Package. Within a competency standard unit there may be advice as to additional reporting that is preferred by Industry. Where appropriate, RTOs should recognise and support this preference.

Qualifications

The Electrotechnology Industry has clearly identified qualifications which are linked to and use the competency standards. These are listed and detailed in Volume 1 Part 1 – Qualifications Framework of this Training Package. Included are details of the content and composition of the qualifications, the Industry Qualifications Framework, completion requirements, the rules for structuring, flexibility arrangements and the qualifications structure for each qualification. Further, there is a full description provided for each qualification which explains its application and gives added meaning to the group of units making up the qualification.

Exporting CSUs from this Training Package

No competency standard unit from this Training Package is to be used in isolation or exported without including all relevant interrelated components such as definitions, glossary, essential knowledge and skills, work performance requirements, matters related to language, literacy and numeracy, access, equity, cultural diversity or any regulatory arrangements that apply.

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1.2.07 Maintenance of Competency Standards

2.7 Maintenance of Competency Standards

The Electrotechnology Industry competency standards were developed and are owned by the industry. However, it is acknowledged that copyright ownership with respect to this material rests with the Commonwealth.
The competency standards must be maintained so that they reflect the ongoing needs of the Electrotechnology Industry and respond in a timely manner to changed technologies and circumstances.
The parties (identified in the Preliminary Information of this Training Package) who constitute the Electrotechnology Industry of the ElectroComms and EnergyUtilities Industry Skills Council share responsibility for the maintenance of the competency standards.

- The maintenance of competency standards will be coordinated and managed by ElectroComms and EnergyUtilities Industry Skills Council Ltd trading as E-Oz Energy Skills Australia or its successor.
- Suggestions and proposals for changes from all parties are welcomed. These should be documented and submitted to E-Oz Energy Skills Australia in accordance with its policies and procedures.

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1.2.08 Index of Competency Standard Units

2.8 Index of Competency Standard Units

The units in this Training Package have been placed in Discipline groups that would typically relate to a particular or special area of industry need and for ease in recognition of related unit groupings.

Table 1 – Index of Units and Scopes/Descriptors

A - Assembly units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEA101A	Assemble electronic components	40	2	E101A	UEE20911	UEE21611; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30911; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEA102A	Select electronic components for assembly	20	2	E101A	UEE20911	UEE21611; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30911; UEE40111; UEE40711; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEA103A	Set up and check electronic component	40	2	A101A; A102A; E101A		UEE20911; UEE21911; UEE30111; UEE30311; UEE30911; UEE40711;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	assembly machines					UEE50511; UEE60211; UEE61711
UEENEEA104A	Modify electronic sub assemblies	40	2	A101A; A102A; E101A; E102A and E103A or E104A		UEE20911; UEE21911; UEE30111; UEE30211; UEE30311; UEE30911; UEE40111; UEE40711; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	20	2	A104A; A101A; A102A; E101A; E102A; and E103A or E104A		UEE20911; UEE21911; UEE30111; UEE30311; UEE30911; UEE40711; UEE50511; UEE60211; UEE61711
UEENEEA106A	Use lead-free soldering techniques	40	2	E101A		UEE20911; UEE21911; UEE30211; UEE30311; UEE30911; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEA107A	Make up wiring looms for internal wiring of appliances and machinery	40	2	E101A		UEE21711
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40	3	G109A; E101A; E102A; E104A; E105A; E107A; G006A; G063A; G101A;	UEE30711	UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE62111; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G102A; G106A;		
UEENEEA112A	Fabricate and assemble bus bars	40	3	E102A; E105A; E107A; E101A	UEE30711	UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE62111; UEE63011
UEENEEA113A	Mount and wire control panel equipment	40	3	G109A; E101A; E102A; E104A; E105A; E107A; G006A; G063A; G101A; G102A; G106A;	UEE30711	UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE62111; UEE63011

B - Broadcast units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEB101A	Operate and maintain amateur radio communication stations	40	1	E101A		UEE10111 UEE21911; UEE30911; UEE40711; UEE50511; UEE60211; UEE61711

C - Commercial units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEC001B	Maintain documentation	20	2	None		UEE10111; UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50210 UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE53011; UEE61111; UEE61711; UEE61811; UEE62011; UEE62111; UEE62411
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20	3	None		UEE10111; UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50210 UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE53011; UEE61111; UEE61711; UEE61811; UEE62011; UEE62111; UEE62411
UEENEEC003B	Provide quotations for installation or service jobs	20	3	None		UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43111; UEE43211; UEE50111; UEE50210 UEE50411; UEE50311; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE53011; UEE61111; UEE61711; UEE61811; UEE62011;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE62111; UEE62411
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40	4	None		UEE40111; UEE40711; UEE41511; UEE41611; UEE42011; UEE42111; UEE50111; UEE50511; UEE50711; UEE60211; UEE60411; UEE61711; UEE61811; UEE62011
UEENEEC005B	Estimate electrotechnology projects	40	4	None		UEE40111; UEE40611; UEE40711; UEE40911; UEE41511; UEE41611; UEE42011; UEE42111; UEE42211; UEE42911; UEE43111; UEE50111; UEE50211; UEE50411; UEE50511; UEE50711; UEE50911; UEE51011; UEE51111; UEE51211; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60	5	C005B		UEE50111; UEE50411; UEE50511; UEE50711; UEE51011; UEE51111; UEE51211; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011
UEENEEC007B	Manage contract variations	40	6	None		UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE63011
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20	2	None		UEE10111; UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911
UEENEEC009B	Provide quotations for inspection and compliance audit services	80	4	None		UEE40211; UEE42111
UEENEEC010B	Deliver a service to customers	20	2	None		UEE10111; UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50210 UEE50311; UEE50411; UEE50511; UEE50711; UEE50911; UEE51011; UEE51111;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE53011; UEE61111; UEE61711; UEE61811; UEE62011; UEE62111; UEE62411
UEENEEC012B	Direct technical and non-technical enquiries to appropriate personnel	20	2	None		UEE20811
UEENEEC013B	Participate in business equipment work and competency development activities	120	3	None	UEE30111	
UEENEEC014B	Participate in computer equipment work and competency development activities	100	3	None	UEE30211	
UEENEEC016B	Participate in voice and data communications work and competency development activities	100	3	None	UEE30411	
UEENEEC017B	Participate in appliance servicing work and competency development activities	60	3	None	UEE32111	
UEENEEC018B	Participate in electrical	60	3	None	UEE30611	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	machine repair work and competency development activities					
UEENEEC019B	Participate in switchgear and controlgear work and competency development activities	60	3	None	UEE30711	
UEENEEC020B	Participate in electrical work and competency development activities	60	3	None	UEE30811; UEE33011	
UEENEEC021B	Participate in electronics and communications work and competency development activities	60	3	None	UEE30911; UEE32011	
UEENEEC022B	Participate in fire protection control work and competency development activities	60	3	None	UEE31011	
UEENEEC023B	Participate in gaming electronic work and competency development activities	60	3	None	UEE31111	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEC024B	Participate in instrumentation and control work and competency development activities	60	3	None	UEE31211	
UEENEEC025B	Participate in refrigeration and air conditioning work and competency development activities	60	3	None	UEE32211	
UEENEEC026B	Participate in security equipment work and competency development activities	60	3	None	UEE31411	
UEENEEC027B	Participate in rail communications and networks work and competency development activities	60	3	None	UEE31511	

D - Computerised Systems units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEED101A	Use computer applications relevant to a workplace	20	1	E101A	UEE10111	UEE20511; UEE20911; UEE21011; UEE21211; UEE21311; UEE21611; UEE21711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE53011; UEE61111; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62411
UEENEED102A	Assemble, set-up and test computing devices	80	2	E101A	UEE20511; UEE30211; UEE40111; UEE61711; UEE61811	UEE21211; UEE21911; UEE30111; UEE30311; UEE30411; UEE30911; UEE31111; UEE40211; UEE40711;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE41511; UEE43211; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61111
UEENEED103A	Evaluate and modify object oriented code programs	40	4	D101A; E101A		UEE40711; UEE41511; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61811
UEENEED104A	Use engineering applications software on personal computers	40	3	E101A	UEE30211; UEE40111; UEE43211; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011	UEE30111; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31511; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41211; UEE41511; UEE41711; UEE41911; UEE42011; UEE42211; UEE43011; UEE43111; UEE50111; UEE50211; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60211; UEE60411
UEENEED110A	Set up, create and implement content for a web server	120	5	E101A		UEE50111; UEE50511; UEE50911; UEE51011; UEE60211; UEE60411; UEE61511; UEE61711; UEE61811

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEED111A	Develop, implement and test object oriented code	140	5	D101A; E101A		UEE30311; UEE50111; UEE50511; UEE50911; UEE51011; UEE60211; UEE60411; UEE61511; UEE61711; UEE61811
UEENEED112A	Support computer hardware and software for engineering applications	120	2	D102A; E101A	UEE30211; UEE40111; UEE61811	UEE30911; UEE40711; UEE41511; UEE50111 UEE50511; UEE50811; UEE60211; UEE60411; UEE61711
UEENEED113A	Install and administer Unix based networked computers	80	4	E101A		UEE40111; UEE50111; UEE50811; UEE60411; UEE61711; UEE61811
UEENEED114A	Design and manage enterprise computer networks	80	6	E101A		UEE60411; UEE61711; UEE61811
UEENEED115A	Administer computer networks	80	4	D124A; E101A		UEE50111; UEE50811; UEE60411; UEE61711; UEE61811
UEENEED116A	Develop computer network services	120	4	E101A		UEE50511; UEE50911; UEE51011; UEE60411; UEE61511; UEE61711; UEE61811
UEENEED117A	Install and configure network systems for	120	4	E101A	UEE61811	UEE40111; UEE43211; UEE50111; UEE50811; UEE60411; UEE61711

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	internetworking					
UEENEED118A	Design and implement network systems for internetworking	120	6	E101A		UEE50111; UEE60411; UEE61711; UEE61811
UEENEED119A	Design and implement advanced routing for internetworking systems	100	6	E101A		UEE60411; UEE61711; UEE61811
UEENEED120A	Design and implement remote access for Internetworking systems	100	6	E101A		UEE60411; UEE61711; UEE61811
UEENEED121A	Design and implement multi-layer switching for Internetworking systems	100	6	E101A		UEE60411; UEE61711; UEE61811
UEENEED122A	Design and implement security for Internetworking systems	100	6	E101A		UEE60411; UEE61711; UEE61811
UEENEED123A	Design and implement wireless LANs/WANs for internetworking	100	6	E101A		UEE60411; UEE61711; UEE61811

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	systems					
UEENEED124A	Integrate multiple computer operating systems on a client server local area network	80	4	E101A		UEE40111; UEE50111; UEE50811; UEE60411; UEE61711; UEE61811
UEENEED129A	Develop web pages for engineering applications	40	3	E101A		UEE30211; UEE30911; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61711; UEE61811
UEENEED130A	Select, install, configure and test multimedia components	40	3	D102A; E101A		UEE30211; UEE30311; UEE30911; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61711; UEE61811
UEENEED143A	Install and configure a client computer operating system and software	40	2	E101A	UEE30211; UEE40111	UEE20511; UEE21911; UEE30111; UEE30311; UEE30911; UEE40711; UEE41511; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61711; UEE61811
UEENEED144A	Commission industrial computer systems	20	5	E101A	UEE50111; UEE60411	UEE50911; UEE51011; UEE61511; UEE61711

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEED145A	Modify-redesign of industrial computer systems	20	5	E101A	UEE50111; UEE60411	UEE50911; UEE51011; UEE61511; UEE61711
UEENEED146A	Set up and configure basic local area network (LAN)	40	2	D102A; E101A	UEE30211; UEE40111	UEE20511; UEE21211; UEE21911; UEE30111; UEE30311; UEE30411; UEE30911; UEE31111; UEE40211; UEE40711; UEE41211; UEE41511; UEE43211; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61111; UEE61711; UEE61811
UEENEED147A	Develop energy sector directory services	80	5	E101A		UEE50511; UEE60211; UEE60411; UEE62111; UEE61811; UEE62211;
UEENEED148A	Plan industrial computer systems projects	60	6	E101A		UEE60411; UEE61811
UEENEED149A	Develop energy sector computer network applications infrastructure	80	6	E101A		UEE60211; UEE60411; UEE61811; UEE61111; UEE62211;
UEENEED150A	Develop industrial control programs for microcomputer equipped devices	60	6	E101A		UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811; UEE62211

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEED151A	Provide programming solution for computer systems engineering problems	60	6	E101A		UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811; UEE62211
UEENEED152A	Design embedded controller control systems	80	6	E101A		UEE51011; UEE60211; UEE60411; UEE61711; UEE61811; UEE62211
UEENEED153A	Set up, configure and test biometric devices	40	4	D146A; D102A; E101A		UEE30211; UEE30911; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61711; UEE61811
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120	5	D153A; D102A; D146A; E101A		UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEED155A	Develop and validate biometric equipment/systems installation	120	5	D154A; D102A; D146A; D153A; E101A		UEE50511; UEE60211; UEE60411; UEE61711; UEE61811

E - Cross-Discipline units

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEE006B	Apply methods to maintain currency of industry developments	20	6	None	UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE62211; UEE62311; UEE63011	UEE43111
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20	3	None		UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE40111; UEE40211; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE43011; UEE43111; UEE43211; UEE50111; UEE50311; UEE50411; UEE50511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE50711; UEE50811; UEE50911; UEE51011; UEE53011; UEE61111
UEENEEE011C	Manage risk in electrotechnology activities	60	6	None	UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE62111; UEE62211; UEE62511; UEE63011	UEE60211; UEE60411
UEENEEE012B	Manage electrotechnology projects	40	6	None		UEE60911
UEENEEE013B	Plan electrotechnology projects	60	6	None		UEE60911
UEENEEE015B	Develop design briefs for electrotechnology projects	40	6	None	UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011	UEE50111; UEE50511; UEE62511
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20	2	None		UEE10111; UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE21411; UEE21711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42811; UEE42911; UEE43011; UEE43111; UEE50111; UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE53011; UEE61111; UEE61711; UEE61811; UEE62011; UEE62111; UEE62411
UEENEEE038B	Participate in development and follow a personal competency development plan	20	2	None	UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50211; UEE50311; UEE50411; UEE50511;	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60211; UEE60411; UEE61711; UEE61811	
UEENEEE070B	Write specifications for computer systems engineering projects	40	5	None		UEE50111; UEE50511; UEE60411; UEE61711; UEE61811
UEENEEE071B	Write specifications for electrical engineering projects	40	5	None	UEE53011; UEE61211; UEE62111; UEE62211; UEE62311; UEE63011	
UEENEEE072B	Write specifications for electronics and communications engineering projects	40	5	None		UEE50511; UEE60211
UEENEEE073B	Write specifications for refrigeration and air conditioning engineering projects	40	5	None		
UEENEEE074B	Write specifications for renewable energy engineering projects	40	5	None	UEE50711; UEE60911; UEE62011	
UEENEEE075B	Write specifications for industrial	40	5	None	UEE50911; UEE51011;	UEE50511

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	electronics and control projects				UEE60611; UEE61511	
UEENEEE077B	Write specifications for automated systems projects	40	5	None	UEE61111	
UEENEEE078B	Contribute to risk management in electrotechnology systems	20	6	None	UEE60211; UEE60411	UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE62111; UEE63011
UEENEEE080A	Apply industry and community standards to engineering activities	20	6	E101A	UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011	
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60	6	E101A	UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011	
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60	6	E101A	UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011;	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE62111; UEE62211; UEE62311; UEE63011	
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120	6	None	UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011	
UEENEEE084A	Write specifications for electrotechnology engineering projects	40	5	None	UEE50311; UEE50411; UEE50811	
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20	1	None	UEE10111 UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411;	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50211; UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111;	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE62211; UEE62311; UEE62411; UEE62511; UEE63011	
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40	1	E101A	UEE20111; UEE20411; UEE20511; UEE20711; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911; UEE22011; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911;	UEE10111; UEE20811; UEE22111; UEE50111; UEE50511; UEE60211; UEE60411

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50211; UEE50411; UEE50711; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011	
UEENEEE103A	Solve problems in ELV single path circuits	40	2	E101A	UEE20811; UEE20911; UEE21411; UEE30211; UEE30311; UEE30911; UEE32111; UEE32211; UEE40111; UEE42711; UEE42811; UEE42911; UEE51211; UEE62511	UEE10111; UEE50111; UEE50511; UEE60211; UEE60411
UEENEEE104A	Solve problems in d.c. circuits	80	2	E101A	UEE20711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30311;	UEE20411; UEE20511; UEE21011; UEE21211; UEE21611; UEE21711;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE43011; UEE43111; UEE43211; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE51011; UEE53011; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011	UEE30211; UEE40111; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61811

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEE105A	Fix and secure electrotechnology equipment	20	1	E101A	UEE20111; UEE20711; UEE21011; UEE21211; UEE30111; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE31011; UEE31111; UEE31211; UEE31411; UEE32011; UEE32111; UEE32211; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41611; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE51011; UEE51211; UEE53011; UEE60611; UEE60911; UEE61211; UEE61511; UEE62011; UEE62211;	UEE10111; UEE20411; UEE20511; UEE20811; UEE20911; UEE21311; UEE21611; UEE21711; UEE21911; UEE22011; UEE22111; UEE30211; UEE30911; UEE31111; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811; UEE62111

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE62311; UEE62511; UEE63011	
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40	2	E101A	UEE20111; UEE20411; UEE20711; UEE21011; UEE21211; UEE21611; UEE21711; UEE30111; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50211; UEE50311; UEE50411;	UEE20511; UEE20811; UEE20911; UEE21311; UEE21411; UEE21911; UEE30211; UEE30911; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE50711; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011	
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40	2	E101A; E102; E105A; E107A;	UEE30311; UEE30411; UEE31011; UEE31411; UEE32011; UEE41611; UEE62011	UEE20511; UEE20711; UEE20911; UEE21011; UEE21211; UEE21311; UEE21611; UEE21711; UEE21911; UEE30111; UEE30211; UEE30911; UEE31111; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEE110A	Develop and implement energy sector maintenance programs	60	5	None		UEE40111; UEE40711; UEE42711; UEE42811; UEE43111; UEE50111; UEE50311; UEE50411; UEE50511; UEE51211;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61811; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEE114A	Supervise and coordinate energy sector work activities	40	4	None		UEE40111; UEE40211; UEE40511; UEE40711; UEE41511; UEE41611; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61811; UEE62011
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20	4	None	UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE43011; UEE43111; UEE43211; UEE50111; UEE50211;	UEE41611

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51211; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62511; UEE63011	
UEENEEE118A	Establish, maintain and evaluate energy sector OHS systems	60	5	None		UEE50511; UEE50811; UEE60211
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40	3	E101A; E104A;	UEE31011; UEE31211; UEE32011; UEE41611; UEE42211; UEE51011; UEE61111; UEE61511	UEE30211; UEE30311; UEE40111; UEE50111; UEE50811; UEE60411
UEENEEE121A	Plan an integrated cabling installation system	40	3	E108A or G106A; E101A; E102A; E105A; E107A		UEE30311; UEE30411; UEE30811; UEE30911; UEE40211; UEE40611; UEE40711; UEE41011; UEE41511; UEE50511; UEE60211; UEE61711;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE62111
UEENEEE122A	Carry out preparatory energy sector work activities	60	2	E101A; E102A; E105A;		UEE20411; UEE20811; UEE21311; UEE21711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30311; UEE30911; UEE40711; UEE50511; UEE50811; UEE60211; UEE61711
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80	2	E101A; E104A;		UEE21211; UEE21911; UEE30211; UEE30311; UEE30911; UEE31111; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEE124A	Compile and produce an energy sector detailed report	60	4	None	UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41511; UEE41711; UEE41911; UEE42011; UEE42111;	UEE41211; UEE41611; UEE50111; UEE50511; UEE60211; UEE60411

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE42211; UEE42611; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50211; UEE50311; UEE50411; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011	
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60	5	E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A	UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011	UEE50111; UEE50411; UEE50511; UEE60211; UEE60411
UEENEEE126A	Provide solutions to basic engineering computational	60	5	E129B; or G102A; E101; E104A; G101A or H114B;	UEE51111; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511;	UEE50111; UEE50411; UEE50511; UEE50811; UEE51211; UEE60211;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	problems			E101A and E104A or H169A	UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE63011	UEE60411; UEE62511
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80	6	E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A	UEE62411	UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEE128A	Develop engineering solutions to photonic system problems	80	6	E125A; E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A		UEE60211; UEE60411; UEE60611; UEE61111; UEE61511; UEE61711; UEE61811; UEE62111; UEE63011
UEENEEE129A	Solve electrotechnical engineering problems	60	6	None	UEE62411	UEE60211; UEE60411
UEENEEE130A	Provide solutions and report on routine electrotechnology problems	60	2	None		UEE22011; UEE22111; UEE50811

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEE131A	Solve problems in ELV circuits for non electrical workers	40	2	E101A		UEE21311
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20	2	E101A	UEE20111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011; UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41611; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211;	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50211; UEE50311; UEE50411; UEE50511; UEE50711; UEE50811; UEE50911; UEE51011; UEE51111; UEE51211; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511; UEE63011	
UEENEEE141A	Use of routine equipment/plant/technologies in an energy sector environment	40	1	E101A	UEE22011	UEE21911; UEE30311; UEE30911; UEE50511; UEE60211
UEENEEE142A	Produce products for carrying out energy sector work activities	40	1	E101A; E102A		
UEENEEE143A	Produce routine tools/devices for carrying out energy sector work	40	1	E101A		

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	activities					
UEENEEE144A	Apply technologies and concepts to energy sector work activities	40	1	None		UEE20811
UEENEEE145A	Apply computation when using equipment/materials/concepts in an energy sector environment	120	6	None		UEE21911
UEENEEE146A	Identify effects of energy on machinery and materials in an energy sector environment	120	6	None	UEE62411	UEE30211; UEE30911; UEE50111; UEE50511; UEE60211; UEE60411
UEENEEE147A	Identify building techniques, methods and materials used in energy sector work activities	40	2	E101A	UEE20811; UEE51111	UEE50811
UEENEEE148A	Carry out routine work activities in an energy sector environment	40	1	E101A	UEE10111; UEE22011	UEE20811; UEE22111; UEE30211; UEE30311; UEE30911; UEE50111; UEE50511; UEE60211; UEE60411
UEENEEE149A	Contribute to the operation of support plant and equipment used in electricity supply industry	40	2	E101A		UEE50811
UEENEEE150A	Undertake computations in an	120	6	None		UEE30211; UEE30911;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	energy sector environment					UEE50111; UEE50511; UEE60211; UEE60411; UEE62411
UEENEEE151A	Transport apparatus, equipment and materials	60	2	None		UEE21311; UEE50811
UEENEEE152A	Observe safety practices are followed in the vicinity of isolated electrical cables	20	3	E101A		
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80	6	E101A		UEE50511; UEE60211; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62111; UEE63011
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80	6	E101A		UEE60611; UEE61111; UEE61211; UEE61511; UEE61711; UEE62111; UEE63011
UEENEEE162A	Select drive components for electrical equipment design	80	6	E161A; E101A		UEE60611; UEE61111; UEE61211; UEE61511; UEE62111; UEE63011
UEENEEE163A	Analyse materials for suitability	80	6	E161A; E101A		UEE50511; UEE60211;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	in electrical equipment					UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE62111; UEE63011
UEENEEE164A	Design electrical machine drives and production layout plans	80	6	E162A; E163A; E126A; E101A; E161A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A		UEE60611; UEE61111; UEE61211; UEE61511; UEE62111; UEE63011
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20	3	E101A; E148A	UEE10111; UEE22011	UEE20511; UEE20811; UEE20911; UEE21211; UEE21911; UEE22111; UEE30211; UEE30311; UEE30911; UEE31111; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEE185A	Write work activity reports	20	5	None		

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60	3	D104A; E101A; E102A; E107A	;	UEE31211 UEE31811 UEE40411 UEE50211; UEE31211; UEE31811; UEE31211 UEE31811 UEE40411 UEE50211; UEE41611; UEE42011; UEE50211; UEE50811; UEE60611; UEE60911; UEE61111; UEE61511; UEE62011; UEE62111
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60	3	E190A; E104A; E101A; D104A; E102A; E107A		UEE31211 UEE31811 UEE40411 UEE50211 UEE31211; UEE31811; UEE31211 UEE31811 UEE40411 UEE50211; UEE41611; UEE42011; UEE50211; UEE50811; UEE60611; UEE61111; UEE61511; UEE62011; UEE62111
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60	4	E191A; E190A; E104A; D104A; E102A; E107A		UEE40411 UEE50211 UEE40411; UEE50211; UEE40211; UEE41611; UEE42011; UEE50211; UEE50811; UEE60611;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE60911; UEE61111; UEE61511; UEE62011

F - Data and Voice units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEF101A	Install and connect cabling for direct access to telecommunications service	20	2	F106A; E101A Or E102A; E104A; E105A; E107A; E101A		
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120	2	E102A; E104A; E105A; E107A; E101A	UEE20711; UEE30411; UEE31011; UEE20707UEE40211; UEE20707	UEE30211; UEE30311; UEE30811; UEE30911; UEE31411; UEE31511; UEE33011; UEE40111; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41511; UEE41711; UEE43011; UEE43111; UEE50111; UEE50411; UEE50511; UEE53011; UEE60211; UEE60411; UEE61111; UEE61711; UEE61811; UEE62111
UEENEEF103A	Install and maintain	20	4	G116A; G108A;		UEE41111

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	telecommunication cabling for services in lifts			E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A;		
UEENEEF104A	Install and modify performance data communication copper cabling	40	3	F102A; E101A; E102A; E104A; E105A; E107A	UEE30407UEE30411; UEE30407UEE40211; UEE30407	UEE30211; UEE30811; UEE30911; UEE31011; UEE31511; UEE33011; UEE40111; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41511; UEE41711; UEE43011; UEE50111; UEE50411; UEE50511; UEE53011; UEE60211; UEE60411; UEE61111; UEE61711; UEE61811; UEE62111
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40	3	F102A; E102A; E104A; E105A; E107A; E101A	UEE30407UEE30411; UEE30407UEE30407	UEE30211; UEE30911; UEE31011; UEE31511; UEE40111; UEE40211; UEE40711; UEE40811; UEE41511; UEE41711; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEF106A	Solve problems in voice and data communications	40	2	E101A		UEE21911 UEE30911; UEE21910UEE40211; UEE40711; UEE41511 UEE50511; UEE60211;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	circuits					UEE60411; UEE61711; UEE61811
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40	2	E101A		UEE21911; UEE20711 UEE30211; UEE30411; UEE30911; UEE31511; UEE40111; UEE40211; UEE40711; UEE41511; UEE41711 UEE50511; UEE50111; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEF108A	Select and arrange equipment for wireless communication networks	40	3	E101A		UEE30211; UEE30411; UEE30911; UEE31511; UEE40111; UEE40211; UEE40711; UEE41511; UEE41711; UEE43211 UEE50111; UEE60211; UEE60411; UEE61111; UEE61711; UEE61811
UEENEEF109A	Install and connect data and voice communication equipment	40	3	F104A; F105A; F102A; E102A; E104A; E105A; E107A; E101A	UEE30407UEE30411; UEE30407UEE30407	UEE30211; UEE30911; UEE31511; UEE40111; UEE40211; UEE40711; UEE41511; UEE41711; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40	3	F104A; F105A; F102A; E102A; E104A; E105A; E107A; E101A	UEE30407UEE30411; UEE30407UEE30407	UEE30211; UEE30911; UEE31511; UEE40111; UEE40211; UEE40711; UEE41511; UEE41711; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEF111A	Test, report and rectify faults in data and voice installations	40	3	F104A; F105A; F102A; E102A; E104A; E105A; E107A; E101A	UEE30407UEE30411; UEE30407UEE30407	UEE30911; UEE40211; UEE40711; UEE41511; UEE50511; UEE60211; UEE61711
UEENEEF112A	Install aerial telecommunication cables	40	3	F102A; E102A; E104A; E105A; E107A; E101A		UEE30411; UEE40211
UEENEEF113A	Install underground communication cables	40	3	F102A; E102A; E104A; E105A; E107A; E101A		UEE30411; UEE40211
UEENEEF114A	Set up and configure basic data communication systems	40	3	D102A; E101A		UEE30411; UEE30911; UEE40211; UEE40711; UEE41511 UEE50511; UEE60211; UEE61711
UEENEEF115A	Assemble and connect telecommunication frames and cabinets	60	2	E102A; E105A; E107A; E101A		UEE30711; UEE30411; UEE30711; UEE33011; UEE30711; UEE40211; UEE43011; UEE53011

G - Electrical units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEG006A	Solve problems in single and three phase low voltage machines	80	3	E101A; E102A; E104A; E105A; E107A; G101A; G102A; G106A	UEE30611; UEE30711; UEE30811; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42011; UEE42111; UEE42611; UEE43011; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE53011; UEE60611; UEE60911; UEE61211; UEE62111; UEE62211; UEE62311; UEE63011	UEE61111
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60	3	E101A; E102A; E104A; E105A; E107A; G101A; G102A; G106A	UEE30811; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42011; UEE42111; UEE42611; UEE43011; UEE43111;	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE53011; UEE60611; UEE60911; UEE61211; UEE62111; UEE62211; UEE62311; UEE63011	
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40	3	E101A; E102A; E104A; E105A; E107A; G101A; G102A; G106A;	UEE30711; UEE30811; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42011; UEE42111; UEE42611; UEE43011; UEE43111; UEE50211; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE53011; UEE60611; UEE60911; UEE61211; UEE62111; UEE62211; UEE62311; UEE63011	
UEENEEG076A	Install and replace low voltage current	20	4	G105A; E101A; E102A; E104A; E105A; E107A;		UEE40611; UEE41011; UEE41911; UEE42011;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	transformer metering			E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;		UEE42111; UEE43111; UEE50311; UEE50411; UEE60911; UEE62211
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60	3	E104A: E101A	UEE30611; UEE30711; UEE30811; UEE32011; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41611; UEE41911; UEE42011; UEE42111; UEE42611; UEE43011; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE53011; UEE60611; UEE60911; UEE61211; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011	UEE43211; UEE61111
UEENEEG102A	Solve problems in low voltage a.c. circuits	80	3	E101A; E104A; G101A;	UEE30611; UEE30711; UEE30811; UEE33011; UEE40311; UEE40411; UEE40511; UEE40611;	UEE43211; UEE61111

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42011; UEE42111; UEE42611; UEE43011; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE53011; UEE60611; UEE60911; UEE61211; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011	
UEENEEG103A	Install low voltage wiring and accessories	20	3	E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G106A; G107A; 108A; G109A;	UEE30811; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41911; UEE42011; UEE42111; UEE42611; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE60611; UEE60911; UEE61211; UEE62211; UEE62311	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20	3	E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G106A; G107A; G108A; G109A;	UEE30811; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42011; UEE42611; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE60611; UEE60911; UEE61211; UEE62211; UEE62311	
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40	3	E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;	UEE30811; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42111; UEE42611; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE60611; UEE60911; UEE61211; UEE62211; UEE62311	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40	3	E101A; E102A; E105A; E107B	UEE30611; UEE30811; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42011; UEE42111; UEE42611; UEE43011; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE53011; UEE60611; UEE60911; UEE61211; UEE62111; UEE62211; UEE62311; UEE63011	UEE43211; UEE61111
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60	3	E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A	UEE30811; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42011; UEE42111; UEE42611; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711;	UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE50911; UEE53011; UEE60611; UEE60911; UEE61211; UEE62111; UEE62211; UEE62311	
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40	3	E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A;	UEE30811; UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42011; UEE42111; UEE42611; UEE43011; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE53011; UEE60611; UEE60911; UEE61211; UEE62211; UEE62311; UEE63011	
UEENEEG109A	Develop and connect electrical control circuits	80	3	E101A; E102A; E104A; E105A; E107A; G006A; G063A; G101A; G102A; G106A;	UEE33011; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41911; UEE42011; UEE42111;	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE42611; UEE43011; UEE43111; UEE50211; UEE50311; UEE50411; UEE50711; UEE50911; UEE53011; UEE60611; UEE60911; UEE61211; UEE62211; UEE62311; UEE63011	
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60	3	G108A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A;		UEE30811; UEE33011; UEE40611; UEE40911; UEE41111; UEE43011; UEE50411; UEE50911; UEE53011; UEE60611; UEE63011
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40	2	E102A; E101A	UEE21711; UEE30611; UEE30711; UEE21711; UEE21711	UEE20411; UEE30811; UEE33011; UEE40611; UEE43011; UEE43211; UEE50411; UEE50911; UEE53011; UEE60611; UEE61111; UEE62111; UEE63011
UEENEEG113A	Install and maintain emergency safety systems	60	3	E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A;		UEE30811; UEE40311; UEE40611; UEE40811; UEE41011; UEE42111;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G106A; G107A; G108A; G109A;		UEE50411; UEE50911
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80	3	G108A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A;	UEE41111	UEE30811; UEE33011; UEE40311; UEE40611; UEE43011; UEE50411; UEE50911; UEE53011; UEE60611; UEE63011
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60	3	G102A; G108A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G106A;		UEE30811; UEE33011; UEE40311; UEE40411; UEE40611; UEE40911; UEE43011; UEE50211; UEE50411; UEE50911; UEE53011; UEE60611; UEE63011
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60	3	G102A; G108A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G106A		UEE30811; UEE33011; UEE40311; UEE40411; UEE40611; UEE40911; UEE43011; UEE50211; UEE50411; UEE50911; UEE53011; UEE60611; UEE63011
UEENEEG120A	Select and arrange equipment for special	60	3	G107A; E101A; E102A; E104A;		UEE30811; UEE40311; UEE40611; UEE42111;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	LV electrical installations			E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A		UEE50411; UEE62111; UEE63011
UEENEEG121A	Verify compliance and functionality of special LV electrical installations	40	4	G105A; G120A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;		UEE40311; UEE40611; UEE40811; UEE41011; UEE42011; UEE42111; UEE50411; UEE62211; UEE62311
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60	4	G105A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;	UEE40311	UEE40511; UEE40611; UEE40811; UEE41011; UEE42011; UEE42111; UEE50411; UEE62211; UEE62311
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40	4	G122A; G105A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A	UEE40311	UEE40511; UEE40611; UEE40811; UEE41011; UEE42011; UEE42111; UEE50411; UEE62211; UEE62311

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60	4	G121A; G123A; G105A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A; ; G120A; G122A		UEE40311; UEE40611; UEE40811; UEE41011; UEE42011; UEE42111; UEE50411; UEE62211; UEE62311
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40	4	G107A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A		UEE40311; UEE40611; UEE41011; UEE42011; UEE42111; UEE50411; UEE60911; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEG126A	Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40	3	G107A; G108A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A		UEE30811; UEE40311; UEE40611; UEE50411
UEENEEG127A	Design electrical installations with a low voltage demand greater than 400 A	40	5	G125A; G107A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A;		UEE50411; UEE53011; UEE60911; UEE62111; UEE62211; UEE62311; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	per phase			G101A; G102A; G106A		
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40	4	G107A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A		UEE40311; UEE40611; UEE41011; UEE42111; UEE43011; UEE50411; UEE53011; UEE60911; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60	3	G164A; E102A; E105A; E107A		UEE30611; UEE30711; UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE50911; UEE53011; UEE63011
UEENEEG130A	Design switchboards rated for high fault levels (greater than 400 A)	60	6	G128A; G107A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A; G149A; E125A; E126A; E029B or G102A or H114B, E104A; or H169B;E103A G102A; E101A; E104A; G101A;		UEE60911; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEG131A	Evaluate performance	40	5	E101A		UEE50311; UEE50411;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	of low voltage electrical apparatus					UEE50711; UEE50811; UEE50911; UEE51011; UEE53011; UEE60611; UEE61111; UEE61211; UEE61511; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60	4	G105A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;		UEE40311; UEE40611; UEE40911; UEE42111; UEE50411; UEE50911; UEE60611; UEE60911; UEE62211; UEE62311
UEENEEG143A	Develop engineering solution for synchronous machine and control problems	60	6	G149A; E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A		UEE60611; UEE61111; UEE61211; UEE62111; UEE63011
UEENEEG144A	Develop engineering solutions for d.c. machine and control problems	60	6	E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A		UEE60611; UEE61111; UEE61211; UEE62111; UEE63011
UEENEEG145A	Develop engineering solutions for induction machine	60	6	G149A; E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A		UEE60611; UEE61111; UEE61211; UEE62111; UEE62211; UEE62311;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	and control problems			and E104A or H169A		UEE63011
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60	5	E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A	UEE60611; UEE60911; UEE61211; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011	UEE50411; UEE53011; UEE61111
UEENEEG150A	Wind electrical coils	40	2	E101A; E102A; E107A;	UEE20411; UEE30611	UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG151A	Place and connect electrical coils	40	2	E104A; G150A; E101A; E102A; E107A	UEE30611	UEE20411; UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG152A	Rewind single phase machines	40	3	G151A; G006A; E101A; E102A; E104A; E105A; E107A; G101A; G102A; G106A; G150A		UEE30611; UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG153A	Rewind three phase low voltage induction machines	60	3	G151A; G006A; E101A; E102A; E104A; E105A; E107A; G101A; G102A; G106A; G150A	UEE30611	UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG154A	Rewind LV direct	60	3	G151A; G101A; E101A;		UEE30611; UEE30811;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	current machines			E102A; E104A; E107A; G150A		UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV	60	4	G153A; E101A; E102A; E104A; E107A; G150A		UEE40611; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG156A	Rewind HV three phase induction machines rated for voltages above 3.3 kV	60	4	G155A; E101A; E102A; E104A; E107A; G150A; G153A		UEE40611; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG157A	Conduct electrical tests on LV electrical machines	40	3	G108A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A; OR G153A; G151A; G006A; E101A; E102A; E104A; E105A; E107A; G101A; G102A; G106A; G150A	UEE30611	UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE62211; UEE62311; UEE63011
UEENEEG158A	Conduct electrical tests on HV electrical	60	4	G157A; G108A; E101A; E102A;		UEE40611; UEE43011; UEE50411; UEE53011;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	machines			E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A; OR G153A; G151A; G006A; E101A; E102A; E104A; E105A; E107A; G101A; G102A; G106A; G150A		UEE62211; UEE62311; UEE63011
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40	3	G157A; G108A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A; OR G153A; G151A; G006A; E101A; E102A; E104A; E105A; E107A; G101A; G102A; G106A; G150A		UEE30611; UEE30811; UEE33011; UEE40611; UEE43011; UEE50411; UEE53011; UEE62211; UEE62311; UEE63011
UEENEEG160A	Evaluate performance of LV electrical machines	40	6	G157A; G108A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A;		UEE60611; UEE61111; UEE61211; UEE62111; UEE62211; UEE62311; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				AND G143A; G149A; E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A OR G044B; E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A OR G145A; G149A; E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A		
UEENEEG161A	Design and develop modifications to LV electrical machines	60	6	G160A; G157A; G108A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A; AND		UEE60611; UEE61111; UEE61211; UEE62111; UEE62211; UEE62311; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G143A; G149A; E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A OR G044B; E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A OR G145A; G149A; E126A; E129B; or G102A; E101; E104A; G101A or H114B; E101A and E104A or H169A		
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40	4	G105A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;		UEE40311; UEE40611; UEE41011; UEE42111; UEE50411; UEE60611; UEE60911; UEE63011
UEENEEG164A	Repair and maintain mechanical	40	3	G111A; E102A; E105A;	UEE30611	UEE30711; UEE30811; UEE33011; UEE40611;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	components of electrical machines			E107A; E101A		UEE43011; UEE43211; UEE50411; UEE53011; UEE61111; UEE63011
UEENEEG165A	Maintain and service traction lifts systems and equipment	40	3	G116A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A; G108A;		UEE30811; UEE33011; UEE40611; UEE41111; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40	3	G116A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A; G108A;		UEE30811; UEE33011; UEE40611; UEE41111; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG167A	Align and install traction lift equipment	20	3	G116A; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A; G102A; G106A; G108A;		UEE30811; UEE33011; UEE40611; UEE41111; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40	4	G116B; E101A; E102A; E104A; E105A; E107A; G006A; G033A; G063A; G101A;	UEE41111	UEE40311; UEE40611; UEE41011; UEE43011; UEE50411; UEE53011; UEE60611; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G102A; G106A; G108A And I124A; H114A and E104A or H169A And I139A; H114A and E104A or H169A		
UEENEEG169A	Manage large electrical projects	40	6	E101A	UEE61211; UEE62111; UEE62211; UEE62311; UEE63011	
UEENEEG170A	Plan large electrical projects	60	6	E101A	UEE61211; UEE62111; UEE62211; UEE62311; UEE63011	
UEENEEG171A	Install, set up and commission interval metering	20	3	G104A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G106A; G107A; G108A; G109A;	UEE42011	UEE30811; UEE40311; UEE41011; UEE41911; UEE42111; UEE43111; UEE50311; UEE50411; UEE50711; UEE60911; UEE62211; UEE63011
UEENEEG172A	Investigate and report on electrical incidents and causes	60	4	G105A; G122A; G123A E101A; E102A; E104A; E105A; E107A; E137A;		UEE40311; UEE40611; UEE40811; UEE41011; UEE42011; UEE42111;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;G108A; G109A;		UEE50411; UEE62211; UEE62311; UEE63011
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80	4	E101A	UEE42011	UEE40311; UEE40611; UEE40811; UEE41011; UEE42111; UEE50411; UEE50711; UEE60911; UEE63011
UEENEEG177A	Select low voltage power factor correction equipment	40	4	G105A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A; G108A; G109A;		UEE40611; UEE41011; UEE42111; UEE50411; UEE60611; UEE60911
UEENEEG179A	Develop detailed electrical drawings	60	4	E192A; D104A; E101A; E102A; E104A; E107A; E190A; E191A;	UEE40411 UEE50211; UEE40411; UEE50211; UEE40411 UEE50211; UEE40411	UEE40611; UEE40811; UEE40911; UEE41011; UEE41011; UEE42011; UEE42111; UEE43011; UEE50211; UEE50411; UEE50911; UEE53011; UEE60611; UEE60911; UEE61111; UEE62111;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE63011
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60	5	G179A; D104A; E101A; E102A; E104A; E107A; E190A; E191A; E192A		UEE50211; UEE50411; UEE50911; UEE51011; UEE53011; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE62011; UEE62111; UEE63011
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20	3	None		UEE30811; UEE33011; UEE40611; UEE41011; UEE42111; UEE43011; UEE43111; UEE50411; UEE53011; UEE61111; UEE62111; UEE63011
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40	3	G181A		UEE30811; UEE33011; UEE40611; UEE41011; UEE42111; UEE43011; UEE43111; UEE50411; UEE53011; UEE61111; UEE62111; UEE63011
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic	20	3	G182A; G181A		UEE30811; UEE33011; UEE40611; UEE41011; UEE42111; UEE43011; UEE50411; UEE53011;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	effect					UEE61111; UEE62111; UEE63011
UEENEEG184A	Provide photometric data for illumination system design	60	4	None		UEE40611; UEE41011; UEE42111; UEE43111; UEE50411; UEE62111; UEE63011
UEENEEG185A	Select effective and efficient light sources and luminaries for given locations and designs	60	4	G184A		UEE40611; UEE41011; UEE42111; UEE43111; UEE50411; UEE62111; UEE63011
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings	20	4	G185A; G184A		UEE40611; UEE41011; UEE42111; UEE43111; UEE62111; UEE63011
UEENEEG187A	Design effective and efficient lighting for public, open and sports areas	20	5	G185A; G184A		UEE50411; UEE53011; UEE60911; UEE62111; UEE63011
UEENEEG188A	Prepare quotations for the supply of effective and efficient	20	4	G185A; G184A		UEE40611; UEE41011; UEE42111; UEE50411;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	lighting products for lighting projects					UEE62111; UEE63011
UEENEEG189A	Install and maintain emergency lighting systems	40	3	G103A; G104A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G106A; G107A; G108A; G109A;		UEE30811; UEE40611; UEE41011; UEE42111; UEE50411; UEE63011
UEENEEG197A	Apply currency of safe working practices and compliance verification of electrical installations	20	4	Unrestricted Electrician's Licence		Skill Sets only
UEENEEG198A	Apply compliance requirements to all aspects of electrical work	20	4	Unrestricted Electrician's Licence		Skill Sets only
UEENEEG199A	Conduct compliance and functional verification of electrical apparatus and existing circuits	40	3	E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G106A; G108A; G109A;	UEE31211; UEE31211; UEE33011; UEE31211; UEE43011; UEE31211; UEE53011; UEE63011	

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H - Electronic units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40	2	E102A; E107A and E104A; or E123A; E101		UEE20411; UEE20511; UEE20711; UEE21911; UEE22011; UEE22111; UEE30211; UEE30311; UEE30911; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40	2	E102A; E101A	UEE21911; UEE30111; UEE30911; UEE31011; UEE31111; UEE31511; UEE40711; UEE41511; UEE61711	UEE20511; UEE20911; UEE21011; UEE21211; UEE21611; UEE22011; UEE22111; UEE30211; UEE30711; UEE30811; UEE31211; UEE31411; UEE33011; UEE40111; UEE40411; UEE40611; UEE40811; UEE40911; UEE41011; UEE41711; UEE42211; UEE43011; UEE50111; UEE50211; UEE50411; UEE50511; UEE50711; UEE50911;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE51011; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61511; UEE62111; UEE63011
UEENEEH103A	Repair routine business equipment faults	120	2	E102A; E105A; E107A; E101A	UEE30111	UEE21911; UEE30211; UEE30311; UEE30911; UEE31411; UEE40111; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEH104A	Set up and test residential video/audio equipment	40	2	E101A;	UEE30311	UEE21211; UEE21911; UEE30911; UEE31411; UEE40711; UEE40811; UEE41511; UEE50511; UEE60211; UEE61711
UEENEEH105A	Verify functionality and compliance of custom electronic installations	40	3	H106A; E108A; E102A; E105A; E107A; E101A	UEE30311	UEE30911; UEE40711; UEE40811; UEE41511; UEE50511; UEE60211; UEE61711
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings	120	2	E108A; E102A; E105A; E107A; E101A	UEE30311	UEE30911; UEE40711; UEE41511; UEE50511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	and premises					UEE60211; UEE61711
UEENEEH107A	Repair predictable faults in general electronic apparatus	40	3	H112A; H113A; H138; E101A; E102A; H102A; H111A; And H114A; E104A; H169A Or E104A; G101A; G102A;		UEE30111; UEE30311; UEE30911; UEE31111; UEE40711; UEE41511; UEE50511; UEE60211; UEE61711
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	60	2	E102A; E105A; E107A; E101A	UEE21211	UEE21911; UEE30311; UEE30911; UEE40711; UEE41511; UEE50511; UEE60211
UEENEEH109A	Set up and test gaming and game equipment	60	2	E101A	UEE31111	UEE21911; UEE30311; UEE30911; UEE40711; UEE41511; UEE50511; UEE60211
UEENEEH110A	Install commercial video/audio system components	120	2	E102A; E105A; E107A; E108A; E101A		UEE30311; UEE30911; UEE40711; UEE41511; UEE50511; UEE60211

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40	3	H102A; And H114A; E104A; H169A Or E104A; G101A; G102A;	UEE30111; UEE30911; UEE31111; UEE31511; UEE40711; UEE41511; UEE41711; UEE61711	UEE30211; UEE30711; UEE30811; UEE31011; UEE31211; UEE33011; UEE40111; UEE40411; UEE40611; UEE40811; UEE40911; UEE41011; UEE42211; UEE43011; UEE43211; UEE50111; UEE50211; UEE50411; UEE50511; UEE50711; UEE50911; UEE51011; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61511; UEE61811; UEE62111; UEE63011
UEENEEH112A	Troubleshoot digital sub-systems	80	3	H102A; E101A	UEE30911; UEE31111; UEE31511; UEE40711; UEE41511; UEE41711; UEE61711; UEE61811	UEE30111; UEE30211; UEE31211; UEE40111; UEE42211; UEE50111; UEE50511; UEE60211; UEE60411
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80	3	E101A; H138A; H111A; H102A; And	UEE30911; UEE31111; UEE31511; UEE41511; UEE41711; UEE61711	UEE30111; UEE30211; UEE40111; UEE50111; UEE50511; UEE60211; UEE60411; UEE61811

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				H114A; E104A; H169A Or E104A; G101A; G102A;		
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80	3	E104A; OR H169A; E101A	UEE30111; UEE30311; UEE30411; UEE30911; UEE31111; UEE31411; UEE31511; UEE40711; UEE41511; UEE41711; UEE61711; UEE61811	UEE30211; UEE31211; UEE40111; UEE43211; UEE50111; UEE50511; UEE60211; UEE60411
UEENEEH115A	Develop software solutions for microcontroller based systems	60	3	E101A		UEE30211; UEE30911; UEE31111; UEE31211; UEE31511; UEE40111; UEE40711; UEE41511; UEE41711; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus	40	3	H146A; H113A; E101A; H138A; H111A; H102A; And		UEE30911; UEE40711; UEE41511; UEE50211; UEE50511; UEE60211; UEE61711

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				H114A; E104A; H169A Or E104A; G101A; G102A;		
UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus	120	3	H112A; H113A; H138; E101A; E102A; H102A; H111A; And H114A; E104A; H169A Or E104A; G101A; G102A		UEE30311; UEE30911; UEE31211; UEE40711; UEE41511; UEE50511; UEE60211; UEE61711
UEENEEH118A	Fault find and repair electronic apparatus	40	3	E101A		UEE30311; UEE30911; UEE31211; UEE31411; UEE40711; UEE41511; UEE50511; UEE60211; UEE61711; UEE61811
UEENEEH119A	Repair predictable faults in television receivers	120	3	H112A; H113A; H138; E101A; E102A; H102A; H111A;	UEE41511	UEE30311; UEE30911; UEE40711; UEE43011; UEE43211; UEE50511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				And H114A; E104A; H169A Or E104A; G101A; G102A		UEE60211; UEE61711
UEENEEH120A	Fault find and repair gaming and games equipment	80	3	H109A; H111A; H112A; H113A; H138; E101A; E102A; H102A; And H114A; E104A; H169A Or E104A; G101A; G102A		UEE30311; UEE30911; UEE31111; UEE40711; UEE41511; UEE43011; UEE43211; UEE50511; UEE60211; UEE61711
UEENEEH121A	Fault find and repair high volume office equipment	120	3	H103A; E101A; E102A; E105A; E107A;	UEE30111	UEE30911; UEE40711; UEE41511; UEE43211; UEE50511; UEE60211
UEENEEH122A	Fault find and repair remote control apparatus	60	3	H112A; H113A; H138; E101A; E102A;		UEE30911; UEE40711; UEE41511; UEE43211; UEE50511; UEE60211;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				H102A; H111A; And H114A; E104A; H169A Or E104A; G101A; G102A		UEE61711
UEENEEH123A	Fault find and repair microwave heating apparatus	40	3	E137A; E101A		UEE30911; UEE40711; UEE41511; UEE50511; UEE60211; UEE61711
UEENEEH124A	Repair predictable faults in audio components	40	3	H112A; H113A; H138; E101A; E102A; H102A; H111A; And H114A; E104A; H169A Or E104A; G101A; G102A		UEE30311; UEE30911; UEE40711; UEE41511; UEE43011; UEE50511; UEE60211; UEE61711
UEENEEH127A	Set up and adjust commercial radio	60	4	H146B; H113A; E101A;		UEE30311; UEE30911; UEE40711; UEE41711;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	frequency (RF) transmission and reception systems			H138A; H111A; H102A; H172A And H114A; E104A; H169A Or E104A; G101A; G102A;		UEE50511; UEE60211
UEENEEH128A	Install and test microwave antennae and waveguides	60	3	E102A; E105A; E107A; E101A		UEE21911; UEE30311; UEE30911; UEE40711; UEE50511; UEE60211
UEENEEH129A	Fault find and repair navigation systems	60	4	H116B; H172B; H146A; H113A; E101A; H138A; H111A; H102A; And H114A; E104A; H169A Or E104A; G101A; G102A;		UEE40711; UEE50511; UEE60211

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEH130A	Fault find and repair satellite-based surveillance and observation systems	60	4	H116B; H172B; H146A; H113A; E101A; H138A; H111A; H102A; And H114A; E104A; H169A Or E104A; G101A; G102A;		UEE40711; UEE50511; UEE60211
UEENEEH131A	Fault find and repair radar apparatus and systems	120	4	H116B; H172B; H146A; H113A; E101A; H138A; H111A; H102A; And H114A; E104A; H169A Or E104A; G101A; G102A;		UEE31211; UEE40711; UEE41511; UEE50511; UEE60211
UEENEEH132A	Fault find and repair global	60	4	H116B; H172B; H146A; H113A;		UEE31211; UEE40711; UEE41511; UEE50511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	positioning systems			E101A; H138A; H111A; H102A; And H114A; E104A; H169A Or E104A; G101A; G102A;		UEE60211
UEENEEH133A	Fault find and repair telecommunication apparatus and systems	60	4	H112B; H113B; H115B; H113A; E101A; H138A; H111A; H102A; And H114A; E104A; H169A Or E104A; G101A; G102A;		UEE31211; UEE40711; UEE41511; UEE50511; UEE60211; UEE61711
UEENEEH134A	Fault find and repair electronic medical equipment	120	4	H112B; H113B; H115B; H113A; E101A; H138A; H111A; H102A;		UEE40711; UEE41511; UEE50511; UEE60211

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				And H114A; E104A; H169A Or E104A; G101A; G102A;		
UEENEEH135A	Design custom electronic equipment installations	120	5	H105B; H106A; E108A; E102A; E105A; E107A; E101A		UEE40711; UEE41511; UEE41711; UEE50511; UEE60211; UEE61711
UEENEEH136A	Design commercial video/audio installations	120	5	H137B; H110B; E102A; E105A; E107A; E108A		UEE40811; UEE50511; UEE60211; UEE61711
UEENEEH137A	Program and commission commercial video/audio systems	40	4	H110B; E102A; E105A; E107A; E108A		UEE40111; UEE43011; UEE43211; UEE50511; UEE60211
UEENEEH138A	Fault find and repair complex power supplies	40	3	H111B; E102A; E104A; E107A AND; E103A; E104A 0R G101A OR E025B; G107A	UEE30911; UEE31511; UEE40711; UEE41511; UEE41711	UEE30111; UEE30211; UEE31111; UEE40711; UEE50511; UEE60211; UEE61711
UEENEEH139A	Troubleshoot basic	40	3	H102B; AND H114B; OR G102A E102A;	UEE30911; UEE31111; UEE31511; UEE40711;	UEE30111; UEE30211; UEE50111; UEE50511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	amplifier circuits			E104A; E107A AND E104A; E103A	UEE41511;UEE41711; UEE61711	UEE60211; UEE60411; UEE61811
UEENEEH140A	Fault find and repair sonar apparatus and systems	120	4	H112B; H113B; H115B; H116B; H172B; E102A; H146B		UEE40711; UEE41511; UEE50511; UEE60211
UEENEEH141A	Manage computer systems/electronics projects	40	6	None	UEE60211; UEE60411	
UEENEEH142A	Solve oscillator problems	40	3	H114B; H139B E102A; E104A; AND E104A; E103A		UEE30911; UEE50511; UEE60211; UEE61711
UEENEEH145A	Develop engineering solutions to analogue electronic problems	80	5	H139B; E102A; E104A; E107A AND E104A; E103A		UEE50111; UEE50511; UEE60211; UEE60411; UEE61811
UEENEEH146A	Solve fundamental electronic communications system problems	40	3	H113B	UEE30911; UEE40711; UEE41511; UEE61711	UEE43011; UEE43211; UEE60211
UEENEEH147A	Assess electronic apparatus compliance	60	6	None		UEE43011; UEE43211; UEE60211; UEE60611; UEE61111; UEE61511; UEE61711; UEE61811;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE62111; UEE63011
UEENEEH148A	Design and develop advanced digital systems	40	6	None		UEE40111; UEE40611; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEH149A	Develop engineering solutions to audio electronic problems	60	5	H139B; E102A; E104A; E107A AND E104A; E103A		UEE40111; UEE40711; UEE41511; UEE43011; UEE43211; UEE50511; UEE60211; UEE61711
UEENEEH150A	Assemble and set up basic security systems	80	2	E102A; E105A; E107A;	UEE41611; UEE31411	UEE30211; UEE30311; UEE30811; UEE30911; UEE40111; UEE40711; UEE41511; UEE43211; UEE50111; UEE50411; UEE50511; UEE60211; UEE60411; UEE60611; UEE61111; UEE61711; UEE61811; UEE62111; UEE63011
UEENEEH151A	Install large security systems	100	3	H150B; E102A; E105A; E107A	UEE31411	UEE30211; UEE30311; UEE30911; UEE40711; UEE41511; UEE43011; UEE50111; UEE50511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE60211; UEE60411; UEE61811
UEENEEH152A	Enter instructions and test wired and wireless security systems	40	3	H150B; E102A; E105A; E107A	UEE31411	UEE30211; UEE30311; UEE30911; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEH153A	Program and test large security systems	120	4	H154B; H155B; H156B; H152B; H150B; E102A; E105A; E107A		UEE31411; UEE40711; UEE41511; UEE43011; UEE43211; UEE50511; UEE60211
UEENEEH154A	Program and commission commercial security systems	60	3	H152B; H150B; E102A; E105A; E107A		UEE30911; UEE31411; UEE40711; UEE41511; UEE60211
UEENEEH155A	Program and commission commercial access control security systems	60	3	H152B; H150B; E102A; E105A; E107A		UEE30911; UEE31411; UEE40711; UEE41511; UEE60211
UEENEEH156A	Program and commission commercial security closed circuit television systems	60	3	H152B; H150B; E102A; E105A; E107A		UEE30911; UEE31411; UEE50511; UEE60211
UEENEEH157A	Develop basic plans for	40	4	H153B; H154B;		UEE50511; UEE60211;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	integrating security systems			H155B; H156B; H152B; H150B; E102A; E105A; E107A		UEE60411; UEE61711
UEENEEH158A	Design integrated security systems	40	5	H116B; H157B; H153B; H154B; H155B; H156B; H152B; H150B; H146B; H113B; E102A; E105A; E107A		UEE50511; UEE60211; UEE61711
UEENEEH159A	Design integrated complex security systems for multiple sites	60	5	H117B; H158B; H112B; H113B; H116B; H157B; H153B; H154B; H155B; H156B; H152B; H150B; H146B; H113B; E102A; E105A; E107A; H111B (E102A; E104A; E107A AND E103A; E104A OR G101A; OR E025B; G107A)		UEE40711; UEE50511; UEE60211; UEE61711
UEENEEH160A	Plan large electronic projects	60	6	None		UEE40711; UEE60211; UEE61711

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEH161A	Install fire detection and warning system apparatus	40	2	E102A; E105A; E107A	UEE21011; UEE31011; UEE40811	UEE21911; UEE30911; UEE40711; UEE50511; UEE60211
UEENEEH162A	Verify compliance and functionality of fire protection system installations	60	2	H161B; E102A; E105A; E107A	UEE31011; UEE40811	UEE21011; UEE30911; UEE40711; UEE50511; UEE60211
UEENEEH163A	Enter and verify programs for fire protection systems	40	3	H162B; H161B; E102A; E105A; E107A	UEE31011; UEE40811	UEE30911; UEE40711; UEE50511; UEE60211
UEENEEH164A	Commission large fire protection systems	40	3	H163B; H162B; H161B; E102A; E105A; E107A	UEE40811	UEE30911; UEE31011; UEE40111; UEE40711; UEE41511; UEE50511; UEE60211
UEENEEH165A	Troubleshoot fire protection systems	40	3	H164B; H163B; H162B; H161B; E102A; E105A; E107A		UEE30911; UEE31011; UEE50511; UEE60211
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40	3	None		UEE30211; UEE30911; UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEH167A	Commission electronics and communications systems	20	5	None	UEE50511; UEE60211	UEE40111; UEE40711; UEE41511; UEE50511
UEENEEH168A	Modify - redesign of electronics and communications systems	20	5	E101A	UEE50511; UEE60211	UEE40711; UEE41511; UEE50511
UEENEEH169A	Solve problems in basic electronic circuits	100		E101A		UEE21911; UEE30211; UEE30311; UEE30911; UEE31411; UEE40711; UEE41511; UEE50111; UEE50511; UEE60211; UEE60411; UEE61811
UEENEEH171A	Troubleshoot faults in television receivers	120	3	H119B; H112B; H113B; H138B; E102A; H111B (E102A; E104A; E107A AND E103A; E104A OR G101A OR E025B; G107A)		UEE30311; UEE30911; UEE40711; UEE41511; UEE50511; UEE60211; UEE61711
UEENEEH172A	Troubleshoot communication systems	80	3	H146B		UEE30311; UEE30911; UEE41511; UEE50511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE60211; UEE61711
UEENEEH173A	Troubleshoot professional audio reproduction components	120	3	H124B; H112B; H113B; H138B; E102A; H111B (E102A; E104A; E107A AND E103A; E104A OR G101A OR E025B; G107A)		UEE30311; UEE30911; UEE40711; UEE41511; UEE41711; UEE50511; UEE60211
UEENEEH174A	Troubleshoot audio - video recording equipment	120	3	H117B; H112B; H113B; H138B; E102A; H111B (E102A; E104A; E107A AND E103A; E104A OR G101A OR E025B; G107A)		UEE30311; UEE30911; UEE40711; UEE41511; UEE41711; UEE50511; UEE60211; UEE61711
UEENEEH175A	Troubleshooting in security system installations	60	4	H153B; H154B; H155B; H156B; H152B; H150B; E102A; E105A; E107A		UEE40711; UEE41511; UEE41711; UEE50511; UEE60211; UEE61711
UEENEEH176A	Diagnose and rectify faults in electronic display circuits	60	4	H171B; H119B; H112B; H113B; H138B; E102A; H111B (E102A; E104A; E107A AND E103A;		UEE40711; UEE41511; UEE41711; UEE50511; UEE60211; UEE61711

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				E104A OR G101A OR E025B; G107A)		
UEENEEH177A	Diagnose and rectify faults in recording and replay equipment	60	4	H174B; H117B; H112B; H113B; H138B; E102A; H111B (E102A; E104A; E107A AND E103A; E104A OR G101A OR E025B; G107A)		UEE40711; UEE41511; UEE41711; UEE50511; UEE60211; UEE61711
UEENEEH178A	Diagnose and rectify faults in camera circuits and equipment	60	4	H118B		UEE40711; UEE41511; UEE41711; UEE50511; UEE60211; UEE61711
UEENEEH179A	Diagnose and rectify faults in digital television circuits and apparatus	80	4	H176B; H171B; H119B; H112B; H113B; H138B; E102A; H111B (E102A; E104A; E107A AND E103A; E104A OR G101A OR E025B; G107A)		UEE40111; UEE40711; UEE41511; UEE50511; UEE60211; UEE61711
UEENEEH180A	Diagnose and rectify faults in digital transmission circuits and systems	80	4	H176B; H171B; H119B; H112B; H113B; H138B; E102A; H111B		UEE50511; UEE60211

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				(E102A; E104A; E107A AND E103A; E104A OR G101A OR E025B; G107A)		
UEENEEH181A	Design electronic printed circuit boards	40	5	E101A		UEE50111; UEE50511; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEH182A	Develop engineering solutions to RF amplifiers problems	40	5	E101A		UEE50511; UEE60211; UEE61711
UEENEEH183A	Analyse the performance of wireless-based electronic - communication systems	40	5	E101A		UEE50111; UEE50511; UEE50811; UEE60211; UEE60411; UEE61711; UEE61811
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80	6	E101A	UEE50211	UEE40711; UEE60211; UEE60411; UEE60611; UEE61111; UEE61511; UEE61711; UEE61811; UEE62111; UEE63011
UEENEEH185A	Design signal-conditioning subsystems	80	6	E101A		UEE41511; UEE60211; UEE60411; UEE60611; UEE61111; UEE61511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE61711; UEE61811; UEE62111; UEE63011
UEENEEH186A	Commission satellite and microwave communication systems	40	5	H116B; H146B; H113B		UEE50511; UEE60211
UEENEEH187A	Solve problems in electronic musical equipment circuits	40	3	H113B		UEE30911; UEE50511; UEE60211; UEE61711
UEENEEH188A	Design and develop electronics - computer systems projects	40	6	E101A	UEE60211; UEE60411; UEE61711; UEE61811	UEE50511; UEE60611; UEE61111; UEE61511; UEE62111; UEE63011
UEENEEH189A	Provide Gate Array solutions for complex electronics systems	60		E101A		UEE30911; UEE50511; UEE60211; UEE60411
UEENEEH190A	Provide engineering solutions to air traffic control system problems	40	5	E101A		UEE50511; UEE60211
UEENEEH191A	Diagnose and rectify faults in air navigation circuits and systems	120	5	H127B; H172C; H190A; H113B; H146B		UEE50511; UEE60211

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEH192A	Develop solutions for air surveillance apparatus and systems	120	5	H116B; H172C; H190A; H113B; H146B		UEE50511; UEE60211

I - Instrumentation and Control Competency Standard Units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40	3	E101A; E107A	UEE31211 UEE31811 UEE40411 UEE50211 UEE31211; UEE31811; UEE40411; UEE50211; UEE31211 UEE31811 UEE40411 UEE50211; UEE40411; UEE42211; UEE31211; UEE31811; UEE40411; UEE50211; UEE51011; UEE61511	UEE30211; UEE30911; UEE33011; UEE40111; UEE40311; UEE40611; UEE40911; UEE41011; UEE43011; UEE43211; UEE50411; UEE50511; UEE50911; UEE53011; UEE60211; UEE60411;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE60611; UEE61111; UEE62111; UEE63011
UEENEEI102A	Solve problems in pressure measurement components and systems	40	3	I101A; E101A; E107A	UEE31211 UEE31811 UEE40411 UEE50211 UEE31211; UEE31811; UEE40411; UEE50211; UEE31211 UEE31811 UEE40411 UEE50211; UEE40411; UEE42211; UEE31211; UEE31811; UEE40411; UEE50211; UEE51011; UEE61511	UEE33011; UEE40611; UEE40911; UEE41011; UEE43011; UEE43211; UEE50411; UEE53011; UEE60611; UEE61111; UEE63011
UEENEEI103A	Solve problems in density/level measurement components and systems	40	3	I102A; I101A; E101A; E107A	UEE31211 UEE31811 UEE40411 UEE50211 UEE31211; UEE31811; UEE40411; UEE50211; UEE31211 UEE31811 UEE40411 UEE50211; UEE40411; UEE42211; UEE31211; UEE31811; UEE40411; UEE50211; UEE51011; UEE61511	UEE33011; UEE40611; UEE40911; UEE41011; UEE43011; UEE43211; UEE50411; UEE50911; UEE53011; UEE60611; UEE61111; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEI104A	Solve problems in flow measurement components and systems	40	3	I102A; E101A; E107A	UEE31211 UEE31811 UEE40411 UEE50211; UEE31211; UEE31811; UEE40411; UEE50211; UEE31211 UEE31811 UEE40411 UEE50211; UEE40411; UEE42211; UEE31211; UEE31811; UEE40411; UEE50211; UEE51011; UEE61511	UEE33011; UEE40611; UEE40911; UEE41011; UEE43011; UEE43211; UEE50411; UEE50911; UEE53011; UEE60611; UEE61111; UEE63011
UEENEEI105A	Solve problems in temperature measurement components and systems	40	3	I101A; E101A; E107A	UEE31211 UEE31811 UEE40411 UEE50211; UEE31211; UEE31811; UEE40411; UEE50211; UEE31211 UEE31811 UEE40411 UEE50211; UEE40411; UEE42211; UEE31211; UEE31811; UEE40411; UEE50211; UEE51011; UEE61511	UEE33011; UEE40611; UEE40911; UEE41011; UEE43011; UEE43211; UEE50411; UEE50911; UEE53011; UEE60611; UEE61111; UEE63011
UEENEEI106A	Set up and adjust PID control loops	40	3	I103A; I104A; I105A; and G102A or E119A (I101B;	UEE31211 UEE31811 UEE50211; UEE31211; UEE31811; UEE50211; UEE31211 UEE31811 UEE50211;	UEE40411; UEE40411; UEE40411;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				E102A; E105A; E107A; G101A; E104A)	UEE42211; UEE31211; UEE31811; UEE50211; UEE51011; UEE61511	UEE43211; UEE61111
UEENEEI107A	Install instrumentation and control cabling and tubing	20	3	I101A; E101A; E107A	UEE31210; UEE31810; UEE50210; UEE31211; UEE31810 UEE50210 UEE31210 UEE31810 UEE50210 UEE42211; UEE31210 UEE31810 UEE50210 UEE51011; UEE61511	UEE33011; UEE40411; UEE43011; UEE43211; UEE53011; UEE61111
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20	3	I101A; E101A; E107A	UEE31210; UEE31810; UEE50210; UEE31211; UEE31810 UEE50210 UEE31210 UEE31810 UEE50210 UEE42211; UEE31210 UEE31810 UEE50210 UEE51011; UEE61511	UEE33011; UEE40411; UEE43011; UEE43211; UEE53011; UEE61111
UEENEEI110A	Set up and adjust advanced PID process control loops	40	3	I106A (I103B; I104B; I105B AND G102A OR H114B; I101B; E102A; E105A; E107A (G101A; E104A)	UEE31210; UEE31810; UEE50210; UEE31211; UEE31810 UEE50210 UEE31210 UEE31810 UEE50210 UEE42211; UEE31210 UEE31810 UEE50210 UEE51011; UEE61511	UEE40411; UEE43211; UEE61111
UEENEEI111A	Find and rectify faults in process final control elements	40	3	I107A; I108A (I101B; E102A; E105A; E107A)	UEE31211; UEE42211; UEE50210UEE61511	UEE40411; UEE43211; UEE61111

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations	40	3	I110A; I113A (I106B; I103B; I104B; I105B AND G102A OR H114B; I101B; E102A; E105A; E107A;G101A; E104A)	UEE31210; UEE31810; UEE40910; UEE42610; UEE50210; UEE50910; UEE60710; UEE61210 UEE31211; UEE31810 UEE40910 UEE42610 UEE50210 UEE50910 UEE60710 UEE61210 UEE31210 UEE31810 UEE40910 UEE42610 UEE50210 UEE50910 UEE60710 UEE61210 UEE42211; UEE31210 UEE31810 UEE40910 UEE42610 UEE50210 UEE50910 UEE51011; UEE60710 UEE61210 UEE61511	UEE43211; UEE61111
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks	60	3	I110A (I106B; I103B; I104B; I105B AND G102A OR H114B; I101B; E102A; E105A; E107A;G101A; E104A)	UEE31210; UEE31810; UEE50210; UEE31211; UEE31810 UEE50210 UEE31210 UEE31810 UEE50210 UEE42211; UEE31210 UEE31810 UEE50210 UEE51011; UEE61511	UEE40411; UEE43211; UEE61111
UEENEEI114A	Trouble shoot process control systems	60	3	I110A (I106B; I103B; I104B; I105B AND G102A OR H114B; I101B;		UEE42211; UEE51011; UEE61511

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				E102A; E105A; E107A;G101A; E104A)		
UEENEEI115A	Trouble shooting in medical equipment control systems	120	3	E101A		UEE51011; UEE61511
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20	2	E101A	UEE21610; UEE30707; UEE31007; UEE21007 UEE21610 UEE30707 UEE31007 UEE21007 UEE21610 UEE30707 UEE31007 UEE21007 UEE21610 UEE30707 UEE31007	UEE20511; UEE21011; UEE21611; UEE21911; UEE30111; UEE30211; UEE30711; UEE30911; UEE31011; UEE33011; UEE40111; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41511; UEE41911;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE42011; UEE42711; UEE42811; UEE43011; UEE43211; UEE50111; UEE50311; UEE50411; UEE50711; UEE50911; UEE53011; UEE60211; UEE60611; UEE60911; UEE61111; UEE61711; UEE62111; UEE63011
UEENEEI117A	Calibrate, adjust and test measuring instruments	40	3	I101A;		UEE30911; UEE42211; UEE50511; UEE51011; UEE60211; UEE61511
UEENEEI118A	Set up weighting measuring and control instruments	20	3	E104A; I101A		UEE51011; UEE61511

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEI119A	Set up industrial field control devices	60	4	I124A; I139A;		UEE40411; UEE40611; UEE40911; UEE50411; UEE50911; UEE53011; UEE60611; UEE61111; UEE62211; UEE63011
UEENEEI120A	Provide solutions to problems in industrial control systems	60	4	I124A; I139A;		UEE40411; UEE40611; UEE40711; UEE40911; UEE50411; UEE50511; UEE50911; UEE53011; UEE60211; UEE60611; UEE61111; UEE62211; UEE63011
UEENEEI121A	Trouble shoot in measuring and analysis systems	40	4	I112B And I118A		UEE42211; UEE50411; UEE51011; UEE61511

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				Or I131A Or 132A Or I133A		
UEENEEI122A	Assist in commissioning process and instrumentation control systems	40	4	I112A (I106B; I103B; I104B; I105B AND G102A OR H114B; I101B; E102A; E105A; E007A; G101A; E104A)		UEE42211; UEE51011; UEE61511
UEENEEI123A	Design electronic control systems	60	6	I124A; I139A;		UEE60211; UEE60611; UEE61111; UEE61511; UEE62111; UEE63011
UEENEEI124A	Fault find and repair analogue circuits and components in	60	4	G108A or I112A	UEE40910; UEE41110; UEE50910; UEE40910 UEE41110 UEE50910 UEE40910UEE41110UEE50910	UEE40411; UEE40611; UEE40711;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	electronic control systems				UEE40911; UEE41111; UEE42211; UEE40910 UEE41110 UEE50910 UEE51011; UEE60611; UEE61511	UEE50111; UEE50211; UEE50411; UEE50511; UEE50911; UEE53011; UEE60211; UEE60411; UEE61111; UEE62211; UEE62311; UEE63011
UEENEEI125A	Provide solutions to fluid circuit operations	60	4	E101A; E102A; E107A		UEE40411; UEE40611; UEE40911; UEE42211; UEE50211; UEE50411; UEE50911; UEE51011; UEE53011; UEE60611; UEE61111; UEE61511; UEE62211; UEE63011
UEENEEI126A	Provide solutions to pneumatic-hydraulic	80	4	I125A (E101A;		UEE40411; UEE40611;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	system operations			E102A; E107A)		UEE40911; UEE42211; UEE50211; UEE50411; UEE50911; UEE51011; UEE53011; UEE60611; UEE61111; UEE61511; UEE62211; UEE63011
UEENEEI127A	Analyse complex electronic circuits controlling fluids	80	5	I125A (E101A; E102A; E107A)		UEE50211; UEE50411; UEE51011; UEE60611; UEE61111; UEE62211; UEE63011
UEENEEI128A	Set up and configure controls on complex fluid systems	80	6	I124A; I127A; I139A		UEE60611; UEE61111; UEE61511; UEE62111; UEE63011
UEENEEI129A	Set up electronically controlled mechanically operated	80	6	I124A; I127A; I139A		UEE60611; UEE61111; UEE61511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	complex systems					UEE62111; UEE63011
UEENEEI130A	Set up electronically controlled robotically operated complex systems	80	6	I124A; I127A; I139A;		UEE60211; UEE60611; UEE61111; UEE61511; UEE62111; UEE63011
UEENEEI131A	Set up gas analysis measuring and control instruments	20	3	E104A; I101A		UEE51011; UEE61511
UEENEEI132A	Set up water analysis measuring and control instruments	20	3	E104A; I101A		UEE51011; UEE61511
UEENEEI133A	Set up scientific analysis measuring and control instruments	20	3	E104A; I101A		UEE51011; UEE61511
UEENEEI134A	Manage instrumentation and control projects	40	6	E101A	UEE60611; UEE61511	
UEENEEI135A	Plan instrumentation and control projects	60	6	E101A	UEE60611; UEE61511	
UEENEEI136A	Manage automated	40	6	E101A	UEE61111	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	control systems projects					
UEENEEI137A	Plan automated and control systems projects	60	6	E101A	UEE61111;	
UEENEEI138A	Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	60	2	E101A	UEE43211	UEE60611; UEE62111; UEE62211; UEE63011
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60	4	G102A or I112A	UEE40910; UEE41110; UEE50910; UEE40910 UEE41110 UEE50910 UEE40910 UEE41110 UEE50910 UEE40911; UEE41111; UEE42211; UEE40910 UEE41110 UEE50910 UEE51011; UEE60611; UEE61511	UEE40411; UEE40611; UEE40711; UEE50211; UEE50411; UEE50511; UEE50911; UEE53011; UEE60211; UEE61111; UEE62211; UEE62311; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEI140A	Plan the electrical installation of integrated systems	20	3	E108A: E101A: E105A; E107A OR G106A; E101A; E102A; E104A; E105A; E107A; G101A;		UEE30411; UEE40211; UEE40311; UEE40411; UEE40611; UEE41011; UEE43111; UEE50211; UEE50311; UEE50411; UEE62111; UEE63011
UEENEEI141A	Develop electrical integrated systems	20	3	D001B And E108A: E101A: E105A; E107A; OR G106A E101A; E102A; E104A; E105A; E107A; G101A;		UEE30411; UEE40211; UEE40311; UEE40611; UEE41011; UEE40411; UEE43111; UEE50211; UEE50311; UEE50411; UEE62111; UEE63011
UEENEEI142A	Develop an electrical integrated system interface for access	20	4	I141A: D001B And E108A: E101A:		UEE40211; UEE40611; UEE43111;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	through a touch screen			E105A; E107A OR G106A; E101A; E102A; E104A; E105A; E107A; G101A;		UEE50211; UEE50311; UEE50411; UEE62111; UEE63011
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20	4	I142A; I141A: D001B And E108A: E101A: E105A; E107A OR G106A; E101A; E102A; E104A; E105A; E107A; G101A;		UEE40211; UEE40611; UEE43112 UEE50211; UEE50311; UEE50411; UEE62111; UEE63011
UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20	4	I142A; I141A: D001B And E108A: E101A: E105A; E107A OR G106A; E101A; E102A; E104A; E105A; E107A; G101A;		UEE40211; UEE40611; UEE43113 UEE50211; UEE50311; UEE50411; UEE62111; UEE63011
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60	5	G006A; I149A		UEE50211; UEE50411; UEE50911;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE51011; UEE53011; UEE60611; UEE61111; UEE61511; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60	5	G101A; I149A		UEE50211; UEE50411; UEE50911; UEE51011; UEE53011; UEE60611; UEE61111; UEE61511; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60	5	G006A; I149A		UEE50211; UEE50411; UEE50911; UEE51011; UEE53011; UEE60611; UEE61111;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE61511; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEI148A	Solve problems in single phase electronic power control circuits	60	4	H113A Or H144A;		UEE40411; UEE40611; UEE40911; UEE41111; UEE42211; UEE50211; UEE50411; UEE50511; UEE50911; UEE51011; UEE53011; UEE60211; UEE60611; UEE61111; UEE61511; UEE62211; UEE63011
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60	4	G102A; I148A		UEE40411; UEE40611; UEE40911; UEE41111; UEE50211; UEE50411;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE50511; UEE50911 UEE51011; UEE53011; UEE60211; UEE60611; UEE61111; UEE61511; UEE62211; UEE63011
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60	3	E101A	UEE30707; UEE31210; UEE31810; UEE50210; UEE31211; UEE31810 UEE50210 UEE30707 UEE31210 UEE31810 UEE50210 UEE42211; UEE30707 UEE31210 UEE31810 UEE50210 UEE51011; UEE61511	UEE30611; UEE30711; UEE31011; UEE32211; UEE33011; UEE40411; UEE40511; UEE40611; UEE40811; UEE40911; UEE41011; UEE41111; UEE41611; UEE41911; UEE42011; UEE42711; UEE42811; UEE43011;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE43211; UEE50411; UEE50711; UEE50911; UEE53011; UEE60411; UEE60611; UEE60911; UEE61111; UEE61711; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60	4	I150A;		UEE40411; UEE40611; UEE40811; UEE40911; UEE41111; UEE41611; UEE42011; UEE42211; UEE42711; UEE42811; UEE50211; UEE50411;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE50911; UEE51011; UEE53011; UEE60611; UEE60911; UEE61111; UEE61511; UEE61711; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60	4	I151A		UEE40411; UEE40611; UEE40811; UEE40911; UEE41111; UEE41611; UEE42011; UEE42211; UEE42711; UEE42811; UEE50211; UEE50411; UEE50911; UEE51011;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE53011; UEE60611; UEE60911; UEE61111; UEE61511; UEE61711; UEE62011; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60	6	I151A		UEE50111; UEE50511; UEE60211; UEE60411; UEE60611; UEE61111; UEE61511; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Interfacing	120	6	I151A		UEE40911; UEE60211; UEE60411; UEE60611; UEE61111; UEE61511;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE61711; UEE62111; UEE62211; UEE62311; UEE63011
UEENEEI155A	Develop structured programs to control external devices	40	4	E101A		UEE40111; UEE40611; UEE40711; UEE41511; UEE42211; UEE50111; UEE50211; UEE50411; UEE50511; UEE50811; UEE50911; UEE51011; UEE53011; UEE60211; UEE60411; UEE60611; UEE61111; UEE61511; UEE62111; UEE62211; UEE62311; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEI156A	Develop and test code for microcontroller devices	60	5	E101A		UEE50111; UEE50211; UEE50411; UEE50511; UEE50911; UEE51011; UEE53011; UEE60211; UEE60411; UEE60611; UEE60911; UEE61111; UEE61511; UEE61711; UEE62111; UEE62211; UEE63011
UEENEEI157A	Configure and maintain industrial control system networks	60	5	E101A		UEE50111; UEE50211; UEE50411; UEE50511; UEE50911; UEE51011; UEE53011; UEE60211; UEE60411; UEE60611;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE61111; UEE61511; UEE61711; UEE62111; UEE62211; UEE62311; UEE63011

J - Refrigeration and Air Conditioning units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEJ040B	Manage refrigeration and air conditioning projects	40		None	UEE62511	
UEENEEJ069B	Plan refrigeration and air conditioning projects	60		None	UEE62411; UEE62511	
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30	2	E101A;	UEE20111; UEE32111; UEE32211; UEE40511; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	UEE22111; UEE30811; UEE33011; UEE40611; UEE43011; UEE50411;

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						UEE53011; UEE63011
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60	3	E101A;	UEE32211; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	UEE22011; UEE22111; UEE30811; UEE33011; UEE40511; UEE40611; UEE43011; UEE50411; UEE51111; UEE53011; UEE62411; UEE63011
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20	3	E101A;	UEE32211; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	UEE20111; UEE30811; UEE32111; UEE33011; UEE40511; UEE40611; UEE43011; UEE50411; UEE53011; UEE63011
UEENEEJ105A	Position, assemble and start up single head split air conditioning and water heating heat	70	2	E101A; J102A; J172A	UEE20111; UEE40511	UEE33011; UEE43011; UEE53011

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	pump systems					
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60	3	E101A; E102A; E105A; E137A; J102A; J103A;	UEE32211; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	UEE33011; UEE43011; UEE53011
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment	80	3	E101A; E102A; E137A; J106A; J108A; J170A; E105A; E107A; J102A; J103A; J194A; J153A;	UEE32211; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60	3	E101A: J102A; J103A	UEE32211; UEE42711;UEE42811;UEE42911; UEE50311; UEE51211; UEE62511	UEE33011; UEE43011; UEE53011
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations	20	3	E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; J194A; P012A; P017A; P024A; P025A;	UEE32211; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50	3	E101A; J103A	UEE32211; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	UEE51111; UEE62411
UEENEEJ111A	Diagnose and rectify faults in air	40	3	J107A; P017A;	UEE32211; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211;	

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	conditioning and refrigeration systems and components			E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J170A; P012A	UEE62511	
UEENEEJ112A	Diagnose and rectify faults in complex air conditioning/ refrigeration systems	100	4	J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A	UEE42711	
UEENEEJ113A	Commission air conditioning and refrigeration systems	40	3	J107A; P017A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J170A; P012A; P017A;	UEE32211; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	
UEENEEJ114A	Resolve problems in hydronic systems	40	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511

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UEENEEJ115A	Resolve problems in beverage dispensers	40	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511
UEENEEJ116A	Resolve problems in transport refrigeration systems	20	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511
UEENEEJ117A	Resolve problems in ultra-low temperature refrigeration systems	20	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511
UEENEEJ118A	Resolve problems in post mix refrigeration systems	20	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A;		UEE32111; UEE32211; UEE42711; UEE42911; UEE50311;

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				J110A; J153A; J170A; P012A; P017A;		UEE51211; UEE62511
UEENEEJ119A	Resolve problems in ice making systems	20	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE50311; UEE51211; UEE62511
UEENEEJ120A	Resolve problems in industrial refrigeration systems	20	3	E101A; E102A; E105A; J102A; J103A; J104A; J106A; ; J107A; J108A ; J111A; J113A; J153A; J170A; P013A; P016A		UEE32211; UEE42711 UEE42911; UEE42711; UEE42911
UEENEEJ121A	Monitor and adjust refrigeration energy management systems	40	4	J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE42711; UEE42811
UEENEEJ122A	Diagnose faults in complex HVAC /refrigeration control	80	4	J112A; J109A; E101A; E102A;		UEE42711; UEE42811

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	systems			E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		
UEENEEJ123A	Commission complex (HVAC) heating, ventilation and air conditioning systems	80	4	J112A; J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE42711; UEE42811
UEENEEJ124A	Commission refrigeration/ air conditioning hydronic systems	80	4	J112A; J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE42711; UEE42811
UEENEEJ125A	Commission complex refrigeration systems	80	4	J112A;		UEE42711;

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	and equipment			J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE42811
UEENEEJ126A	Commission complex refrigeration/air conditioning control systems	80	4	J112A; J122A; J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE42711; UEE42811
UEENEEJ127A	Establish the thermodynamic parameters of refrigeration and air conditioning systems	80	4	J192A J193A OR J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A;	UEE42911; UEE51211; UEE62411; UEE62511	UEE51111

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				P024A; P025A		
UEENEEJ128A	Produce HVAC/R system design drawings	80	4	J164A; J192A; J193A OR J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A	UEE62411; UEE62511	UEE51111; UEE51211
UEENEEJ129A	Establish heat loads for commercial refrigeration and/or air conditioning applications	80	4	J127A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A	UEE42911; UEE51211; UEE62411; UEE62511	UEE51111

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UEENEEJ130A	Produce HVAC/R control system diagrams	40	4	J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ131A	Determine noise and vibration encountered in HVAC/R applications	40	4	J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE51111; UEE51211
UEENEEJ132A	Design commercial refrigeration systems and select components	80	5	J129A; J165A: J127A; J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A;		UEE51111; UEE51211; UEE62411; UEE62511

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				E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		
UEENEEJ133A	Design industrial refrigeration systems and select components	80	5	J132A; J165A: J127A; J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A;		UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ134A	Design heating, ventilation and air conditioning (HVAC) systems and select components	60	5	J129A; J165A: J127A; J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A;		UEE51111; UEE51211; UEE62411; UEE62511

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				P024A; P025A		
UEENEEJ135A	Design control systems for refrigeration or heating, ventilation and air conditioning systems	80	5	J130A; J164A;J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ136A	Evaluate and report on building services energy management systems	80	5	J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A	UEE42811	UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ137A	Evaluate and report on the indoor air quality of buildings	40	5	J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A;		UEE50311; UEE51111; UEE51211; UEE62411; UEE62511

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				J153A; J170A; K142A; P012A; P017A; P024A; P025A		
UEENEEJ138A	Analyse vibration and noise in refrigeration and air conditioning systems	80	6	J165A: J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A	UEE62411; UEE62511	
UEENEEJ139A	Develop specifications and prepare drawings for HVAC/Refrigeration projects	60	6	J128A; J164A;J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE62411; UEE62511
UEENEEJ141A	Design complex commercial refrigeration systems	40	6	J132A; J138A; J127A; J129A; J165A:		UEE62411; UEE62511

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	and select equipment			J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		
UEENEEJ142A	Design complex industrial refrigeration systems and select equipment	40	6	J133A; J138A; J127A; J129A; J132A; J165A: J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE62411; UEE62511
UEENEEJ143A	Design complex air conditioning systems and select equipment	120	6	J134A; J138A; J165A: J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A;		UEE62411; UEE62511

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				J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		
UEENEEJ144A	Design mechanical ventilation/exhaust systems and select equipment	40	6	J134A; J138A; J165A: J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE62411; UEE62511
UEENEEJ145A	Design hydronic systems and select equipment	80	6	J138A; J165A: J164A; J192A; and J193A orJ109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE62411; UEE62511
UEENEEJ146A	Design complex control systems for refrigeration or heating, ventilation, air	80	6	J135A; J130A;J164A;J192A; and J193A or J109A; E101A;		UEE62411; UEE62511

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	conditioning systems			E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		
UEENEEJ147A	Audit energy use for commercial HVAC/Refrigeration systems	40	6	J136A; J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE62511
UEENEEJ148A	Audit HVAC/R control systems for compliance with regulations and standards	60	6	J135A; J130A; J164A;J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE62511

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UEENEEJ149A	Develop heat exchanger design specifications	80	6	J138A; J165A: J164A; J192A; and J193A orJ109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE62411; UEE62511
UEENEEJ150A	Evaluate new and alternative technologies applicable to electrotechnology applications	40	6	None		UEE62411; UEE62511
UEENEEJ151A	Service small electrical appliances and power tools	60	3	G006A; E101A; E102A; E104A; E105A; E107A; G101A; G106A; or P024A and J153A; E107A; J108A; J194A; E101A; E103A;	UEE32111	UEE30611; UEE33011; UEE43011; UEE53011
UEENEEJ153A	Find and rectify faults in motors and	50	3	E107A; J108A; J194A;	UEE32111; UEE32211; UEE42711; UEE42811; UEE42911; UEE50311;	UEE33011; UEE43011;

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	associated controls in refrigeration and air conditioning systems			E101A; E103A;	UEE51211; UEE62511	UEE53011
UEENEEJ154A	Find and rectify faults in appliance control systems and devices	60	3	G006A; E101A; E102A; E104A; E105A; E107A; G101A; G106A; or J153A; E107A; J108A; J194A; E101A; E103A;	UEE32111	UEE33011; UEE43011; UEE53011
UEENEEJ155A	Service refrigeration appliances	60	3	J054B; J062B J102A; J195A and G006A; E101A; E102A; E104A; E105A; E107A; G101A; G106A; or J153A; E107A; J108A ; J194A; E101A; E103A;	UEE32111	UEE33011; UEE43011; UEE53011
UEENEEJ156A	Service clothes washing	40	3	J154A;	UEE32111	UEE33011;

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	machines and dryers			G006A; E101A; E102A; E104A; E105A; E107A; G101A; G106A; or J153A;E107A; J108A ; J194A; E101A; E103A;		UEE43011; UEE53011
UEENEEJ157A	Service electrical heating appliances	60	3	J154A; G006A; E101A; E102A; E104A; E105A; E107A; G101A; G106A; or J153A;E107A; J108A ; J194A; E101A; E103A;		UEE32111; UEE33011; UEE43011; UEE53011
UEENEEJ158A	Service dishwasher machines	40	3	J154A; G006A; E101A; E102A; E104A; E105A; E107A; G101A; G106A; or J153A;E107A; J108A ; J194A; E101A; E103A;		UEE32111; UEE33011; UEE43011; UEE53011
UEENEEJ159A	Service gas heating appliances	40	3	J154A; G006A; E101A; E102A; E104A; E105A; E107A;		UEE32111; UEE33011; UEE43011; UEE53011

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				G101A; G106A; or J153A;E107A; J108A; J194A; E101A; E103A;		
UEENEEJ161A	Verify functionality and compliance of appliances	20	3	E101A; E102A; E103A; E105A; E107A; E137A; J102A; J153A; J154A; J155A; J156A; J162A; J194A; J195A; K142A; P012A; P017A; P024A; P025A; Plus elective units from Schedule 3 to a weighing of 220 points.	UEE32111	
UEENEEJ162A	Recover, pressure test, evacuate, charge and leak test refrigerants — appliances	50	3	J102A; J195A E101A;	UEE32111	UEE33011; UEE43011; UEE53011
UEENEEJ164A	Analyse the operation of HVAC air and hydronic systems	80	4	J192A: J193A: or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A;	UEE51211; UEE62411; UEE62511	UEE51111

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				P024A; P025A		
UEENEEJ165A	Evaluate thermodynamic and fluid parameters of refrigeration systems	100	5	J127A; J164A; J192A; and J193A 0r J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A	UEE51211; UEE62411; UEE62511	UEE51111
UEENEEJ166A	Resolve problems in dairy refrigeration systems	20	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE51211; UEE62511
UEENEEJ167A	Resolve problems in central plant air conditioning systems	40	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42811; UEE42911; UEE51211; UEE62511

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UEENEEJ168A	Maintain microbial control of refrigeration and air conditioning systems	20	3	None		UEE32211; UEE42711; UEE42911; UEE50311; UEE51211; UEE62511
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70	3	J153A; E107A; J108A; J194A; E101A; E103A;	UEE32211; UEE42711; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	UEE33011; UEE43011; UEE53011
UEENEEJ171A	Resolve problems in refrigerated beverage vending cabinets	20	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32111; UEE32211; UEE42711; UEE42911; UEE51211; UEE62511; UEE62511
UEENEEJ172A	Recover, pressure test, evacuate, charge and leak test refrigerants — split systems	60	2	J102A; E101A;	UEE20111; UEE40511	
UEENEEJ173A	Service and repair microwave ovens	40	3	J154A: G006A; E101A; E102A; E104A;		UEE32111; UEE33011; UEE43011;

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				E105A; E107A; G101A; G106A; or J153A; E107A; J108A; J194A; E101A; E103A;		UEE53011
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10	3	None		UEE32111; UEE32211; UEE40511; UEE42711; UEE42911; UEE50311; UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	20	3	J174A; and J155A; J054B; J062B:J102A; J195A and G006A; E101A; E102A; E104A; E105A; E107A; G101A; G106A; or J153A; E107A; J108A; J194A; E101A; E103A; Or		UEE32111; UEE32211; UEE42711; UEE42911; UEE51211; UEE62511

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				J111A; J107A; P017A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J170A; P012A		
UEENEEJ176A	Install and commission hydrocarbon refrigeration systems, components and associated equipment	20	3	J113A; J174A; J075A; J107A; P017A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511
UEENEEJ177A	Design hydrocarbon refrigerated systems	40	5	J132A; J174A; J129A; J165A: J127A; J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A;		UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ178A	Apply safety awareness	10	3	None		UEE32211;

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	and legal requirements for ammonia refrigerant					UEE42711; UEE42911; UEE50311; UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ179A	Repair and service ammonia refrigeration systems	20	3	J178A; J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511
UEENEEJ180A	Install and commission ammonia refrigeration systems, components and associated equipment	20	3	J178A; J179A J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511
UEENEEJ181A	Design ammonia refrigerated systems	40	5	J132A; J178A; J129A; J165A: J127A; J164A;		UEE51111; UEE51211; UEE62411; UEE62511

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				J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		
UEENEEJ182A	Repair and service secondary refrigeration systems	20	3	J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511
UEENEEJ183A	Design secondary refrigerant system	40	5	J132A; J129A; J165A: J127A; J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A;		UEE51111; UEE51211; UEE62411; UEE62511

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				K142A; P012A; P017A; P024A; P025A		
UEENEEJ184A	Apply safety awareness and legal requirements for carbon dioxide refrigerant	10	3	None		UEE32111; UEE32211; UEE42711; UEE42911; UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ185A	Repair and service carbon dioxide refrigeration systems	20	3	J111A; J113A; J184A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511
UEENEEJ186A	Install and commission carbon dioxide refrigeration systems, components and associated equipment	20	3	J184A; J185A J111A; J113A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J153A; J170A; P012A; P017A;		UEE32211; UEE42711; UEE42911; UEE51211; UEE62511

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UEENEEJ187A	Design carbon dioxide refrigerated systems	40	5	J132A; J184A; J129A; J165A: J127A; J164A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ188A	Repair and service self contained carbon dioxide refrigeration and heat pump systems	20	3	J184A and J155A J054B; J062B;J102A; J195A; and G006A; E101A; E102A; E104A; E105A; E107A; G101A; G106A; or J153A; E107A; J108A ; J194A; E101A; E103A;		UEE32111; UEE32211; UEE42711; UEE42911; UEE51211; UEE62511

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				or J111A; J107A; P017A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J170A; P012A		
UEENEEJ189A	Service room air conditioners	30	3	J104A; E010A and J154A; G006A; E101A; E102A; E104A; E105A; E107A; G101A; G106A;or J153A; E107A; J108A ; J194A; E101A; E103A; or J170A; J153A;E107A; J108A ; J194A; E101A; E103A; and J162A; J102A; J195A ; E101A; or		UEE32111

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				J108A E101A: J102A; J103A		
UEENEEJ190A	Select basic commercial refrigeration system equipment, components and accessories	40	4	J110A; E101A; J103A J129A; J127A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		UEE42911; UEE51111; UEE51211; UEE62411; UEE62511
UEENEEJ191A	Select residential air conditioning system equipment, components and accessories	40	4	J110A; E101A; J103A J129A; J127A; J192A; and J193A or J109A; E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A;		UEE42911; UEE51111; UEE51211; UEE62411; UEE62511

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				J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A		
UEENEEJ192A	Analyse the psychrometric performance of HVAC/R systems	50	4	J193A or J109A E101A; E102A; E103A; E105A; E107A; E137A; J102A; J103A; J104A; J106A; J107A; J108A; J110A; J111A; J113A; J153A; J170A; K142A; P012A; P017A; P024A; P025A; and elective units from Schedule 3 to a weighting of 30 points	UEE42911; UEE51211; UEE62411; UEE62511	UEE40511; UEE51111
UEENEEJ193A	Analyse the thermodynamic performance of HVAC/R systems	40	4	None	UEE62411	UEE40511; UEE51111
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40	3	E103A and J103A or J195A E101A;	UEE32111; UEE32211; UEE42811; UEE42911; UEE50311; UEE51211; UEE62511	UEE33011; UEE43011; UEE53011

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UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances	50	3	E101A	UEE32111	UEE33011; UEE43011; UEE53011
UEENEEJ196A	Operate Ammonia Refrigeration Plant	40	3	J178A		

K - Renewable/Sustainable Energy units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems	20	2	K102A; E101A	UEE21311; UEE21411	
UEENEEK102A	Work safely with remote area power supply systems	20	2	E101A	UEE21311; UEE21411	
UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks	40	2	E101A; E102A; E103A; K101A; K102A; E107A; And		UEE21311; UEE21411

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				E131A Or E104A		
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets	40	2	E101A; E102A; E103A; K101A; K102A; E107A; And E131A Or E104A		UEE21311; UEE21411
UEENEEK105A	Conduct periodic maintenance of remote area power supply photo voltaic arrays	40	2	E101A; E102A; E103A; K101A; K102A; E107A; And E131A Or E104A		UEE21311; UEE21411
UEENEEK106A	Conduct periodic maintenance of remote	40	2	E101A; E102A; E103A; K101A;		UEE21311; UEE21411

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	area power supply wind generators			K102A; E107A; And E131A Or E104A		
UEENEEK107A	Conduct checks in the demand side use of remote area power supplies (RAPS)	40	3	E101A; K102A; K103A; K104A; K105A; K106B; E101A; E102A; E103A; K101A		UEE32011; UEE41611; UEE62011
UEENEEK108A	Plan periodic maintenance schedules of remote area power supplies (RAPS)	40	3	E101A; E137A; K102A; K103A; K104A; E101A; E102A; E103A; K101A		UEE32011; UEE41611; UEE62011
UEENEEK109A	Attend to breakdowns in remote area power supplies (RAPS)	20	3	E101A; E102A; E103A; K101A;		UEE32011; UEE41611; UEE62011
UEENEEK110A	Co-ordinate maintenance of renewable energy (RE)	20	4	E101A; E102A; E103A; K101A;		UEE41611; UEE41911; UEE62011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	apparatus and systems					
UEENEEK111A	Assemble and connect remote area power supplies	60	2	E101A; E102A; E107A; E108A And E131A Or E104A		UEE21311; UEE21411
UEENEEK112A	Provide basic sustainable energy solutions for energy reduction in residential premises	40	2	None	UEE22111	UEE21311; UEE21411
UEENEEK114A	Promote sustainable energy practices in the community	40	2	None	UEE22111	UEE20811; UEE21311; UEE21411
UEENEEK116A	Maintain and repair remote area power generation facilities	120	2	K104A E101A; E102A; E103A; E107A; K101A; K102A		UEE21311; UEE21411
UEENEEK117A	Maintain and repair facilities associated	120	2	E101A; E102A;		UEE21311; UEE21411;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	with remote area essential service operations			E103A; And E131A Or E104A		UEE32011; UEE41611; UEE62011
UEENEEK118A	Maintain and monitor remote area essential service (RAPS) operations	120	2	E101A K102A		UEE21311
UEENEEK120A	Maintain operation of remote area power generation plant	120	2	K116A;		UEE32011; UEE41611; UEE62011
UEENEEK121A	Manage renewable energy (RE) projects	40	6	None	UEE60911; UEE62011	
UEENEEK122A	Plan renewable energy (RE) projects	60	6	None	UEE60911; UEE62011	
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	80	2	E104A; E108A; E101A; E102A; E107A;	UEE32011; UEE41611; UEE41911; UEE50711; UEE60911; UEE62011	UEE21311; UEE42011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEK124A	Solve basic problems in micro hydro systems	20	3	G101A		UEE32011; UEE41611; UEE41911; UEE42011; UEE50711; UEE60911; UEE62011
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20	3	E104A; E137A; And E108A Or G106A	UEE32011; UEE41611; UEE41911; UEE42011; UEE62011	UEE30811; UEE40311; UEE40611; UEE50411; UEE50711; UEE60911; UEE62111
UEENEEK127A	Diagnose and rectify faults in renewable energy control systems	60	3	K125A	UEE32011; UEE41611; UEE41911; UEE62011	UEE42011; UEE50711; UEE60911
UEENEEK128A	Solve problems in stand-alone renewable energy systems	60	3	K123A; E104A; E108A; E102A; E103A; E105A; E107A	UEE32011; UEE41611; UEE60911; UEE62011	UEE41911; UEE42011; UEE50711
UEENEEK129A	Design renewable energy (RE) heating	120	5	K128A;		UEE50411; UEE50711;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	systems					UEE60911; UEE62011; UEE62111; UEE63011
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW	60	3	G101A		UEE32011; UEE41611; UEE41911; UEE42011; UEE50711; UEE60911; UEE62011
UEENEEK131A	Design wind energy conversion systems (WECS) rated to 10 kW	60	5	K130A; E104A; E108A; E102A; E103A; E105A; E107A		UEE50411; UEE50711; UEE60911; UEE62011; UEE62111; UEE63011
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20	5	None	UEE50210 UEE50311; UEE50411; UEE50711; UEE50911; UEE51011; UEE51111; UEE53011; UEE60611; UEE60911; UEE61111; UEE61211; UEE61511; UEE61711; UEE61811; UEE62011; UEE62111; UEE62211; UEE62311; UEE62411; UEE62511;	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE63011	
UEENEEK133A	Design hybrid renewable power systems	80	6	K128B; K123B; E104A; E108A; E102A; E103A; E105A; E107A		UEE60911; UEE62011; UEE62111; UEE63011
UEENEEK134A	Install ELV stand-alone photovoltaic power systems	60	3	K125A; E104A; E108A; E102A; E103A; E105A; E107A		UEE32011; UEE41611; UEE41911; UEE42011; UEE50711; UEE60911; UEE62011
UEENEEK135A	Design grid connected photovoltaic power supply systems	60	4	K125A; E104A; E108A; E102A; E103A; E105A; E107A	UEE42011	UEE40611; UEE41611; UEE41911; UEE50411; UEE50711; UEE60911; UEE62011; UEE62111
UEENEEK136A	Install, configure and commission LV	20	3	G103A; K124A		UEE41611; UEE41911;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	micro-hydro systems rated up to 6.4 kW					UEE42011; UEE50711; UEE60911; UEE62011
UEENEEK137A	Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20	3	K124A; E104A; E108A; E102A; E103A; E105A; E107A		UEE32011; UEE41911; UEE41911; UEE42011; UEE50711; UEE60911
UEENEEK138A	Design micro-hydro systems rated to 6.4 kW	60	5	K124A; E104A; E108A; E102A; E103A; E105A; E107A		UEE50411; UEE50711; UEE60911; UEE62011; UEE62111; UEE63011
UEENEEK139A	Design stand-alone renewable energy (RE) systems	40	6	K128A; K123A; E104A; E108A; E102A; E103A; E105A; E107A		UEE60911; UEE62011; UEE62111; UEE63011
UEENEEK140A	Develop engineering solutions to renewable	60	6	K131B; K132B; K135B; K138B;		UEE60911; UEE62011;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	energy (RE) problems			K139B; K130B; K125B; K123B; E104A; E108A; E102A; E103A; E105A; E107A		UEE62111; UEE63011
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20	2	None	UEE10111; UEE20411; UEE20511; UEE20711; UEE20811; UEE20911; UEE21011; UEE21211; UEE21311; UEE21411; UEE21611; UEE21711; UEE21911; UEE22011; UEE22111; UEE30111; UEE30211; UEE30311; UEE30411; UEE30611; UEE30711; UEE30811; UEE30911; UEE31011; UEE31111; UEE31211; UEE31411; UEE31511; UEE32011; UEE32111; UEE32211; UEE33011	UEE62211; UEE62311
UEENEEK143A	Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20	3	K130A		UEE32011; UEE41611; UEE41911; UEE42011; UEE50711; UEE60911; UEE62011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEK144A	Install, configure and commission LV wind energy conversion systems rated up to 10 kW	40	3	G103A; K130A		UEE41911; UEE42011; UEE50711; UEE60911
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20	4	None	UEE40111; UEE40211; UEE40311; UEE40411; UEE40511; UEE40611; UEE40711; UEE40811; UEE40911; UEE41011; UEE41111; UEE41211; UEE41511; UEE41711; UEE41911; UEE42011; UEE42111; UEE42211; UEE42611; UEE42711; UEE42811; UEE42911; UEE43011; UEE43111; UEE43211; UEE50111; UEE50511; UEE51211; UEE60211; UEE60411	UEE50711; UEE51111; UEE60211; UEE60411; UEE61711; UEE61811; UEE62211; UEE62311; UEE62411; UEE62511
UEENEEK146A	Design energy management controls for electrical installations in buildings	80	6	K132A		UEE60911; UEE62011; UEE62111; UEE63011
UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40	3	G103A; K125A;	UEE42011	UEE30811; UEE40311; UEE40611; UEE41911;

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						UEE42011; UEE50411; UEE50711; UEE60911
UEENEEK149A	Verify compliance and functionality of a extra low voltage renewable energy installation	40	3	E101A; E102A; E103A; E104A; E105A; E107A; E108A; E119A; E137A; G101A; K123A; K127A; K128A; K134A	UEE32011; UEE41611; UEE62011	
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	60	6	K132A		UEE51111; UEE51211; UEE60911; UEE62011; UEE62111; UEE62211; UEE62411; UEE62511; UEE63011
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations	20	4	G105A	UEE41011; UEE43111	UEE40611; UEE41911; UEE42011; UEE50411; UEE50711;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
						UEE60911
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises	40	4	K152A	UEE43111	UEE40611; UEE41011; UEE41911; UEE50411; UEE50711; UEE60911
UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities	40	4	K153A		UEE40611; UEE41011; UEE41911; UEE43111; UEE50411; UEE50711; UEE60911
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40	4	K153A		UEE41011; UEE41911; UEE43111; UEE50411; UEE50711; UEE60911

M - Hazardous units

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20	3	M080A and competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF level 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEI112A; MEM7001B Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE30811; UEE31211; UEE33011; UEE40411; UEE40611; UEE40911; UEE42211; UEE42611; UEE43011; UEE50211; UEE50411; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE62311; UEE63011
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20	3	M080A and competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF level 3		UEE30811; UEE31211; UEE33011; UEE40411; UEE40611; UEE40911; UEE42211; UEE42611; UEE43011; UEE50211; UEE50411; UEE51011;

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				or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEI112A; MEM7001B Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE53011; UEE60611; UEE61211; UEE61511; UEE63011
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20	3	M080A and competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF level 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEI112A; MEM7001B Competency required by a given		UEE30811; UEE31211; UEE33011; UEE40411; UEE40611; UEE40911; UEE42211; UEE42611; UEE43011; UEE50211; UEE50411; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20	3	M080A and competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF level 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEI112A; MEM7001B Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to)		UEE30811; UEE31211; UEE33011; UEE40411; UEE40611; UEE42211; UEE42611; UEE43011; UEE50211; UEE50411; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60	3	M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE30811; UEE31211; UEE40411; UEE40611; UEE42211; UEE42611; UEE50411; UEE51011; UEE61211; UEE61511; UEE62311
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60	3	M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to):		UEE30811; UEE31011; UEE31211; UEE40411; UEE40611; UEE40811; UEE42211; UEE42611; UEE50411; UEE51011;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE61211; UEE61511
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60	3	M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but		UEE30811; UEE31211; UEE40411; UEE40611; UEE42211; UEE42611; UEE50411; UEE51011; UEE61211; UEE61511

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				not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60	3	M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE30811; UEE31211; UEE40411; UEE40611; UEE42211; UEE42611; UEE50411; UEE51011; UEE61211; UEE61511
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60	3	M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring		UEE30811; UEE31211; UEE33011; UEE40411; UEE40611; UEE42211; UEE42611; UEE43011;

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				systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF111A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE50411; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE62211; UEE62311; UEE63011
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60	3	M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF111A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or		UEE30811; UEE31211; UEE33011; UEE40411; UEE40611; UEE42211; UEE42611; UEE43011; UEE50411; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE62211; UEE63011

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				service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60	3	M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF111A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE30811; UEE31211; UEE33011; UEE40411; UEE40611; UEE42211; UEE42611; UEE43011; UEE50411; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE63011
UEENEEM030A	Maintain equipment in hazardous areas —	60	3	M080A and competencies in installation of general low-voltage		UEE30811; UEE31211; UEE33011; UEE40411;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	pressurisation			or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF111A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE40611; UEE42211; UEE42611; UEE43011; UEE50411; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE63011
UEENEEM031A	Overhaul and repair of explosion-protected equipment — coal mining	60	3	Competencies in overhaul and repair of general low-voltage or extra-low voltage electrical/electronic equipment at AQF level 3 or equivalent Example are (but not limited to): UEENEEG160A; MEM15020C		UEE33011; UEE42611; UEE43011; UEE53011; UEE62311
UEENEEM032A	Overhaul and repair of explosion-protected	60	3	Competencies in overhaul and repair of general low-voltage or		UEE33011; UEE42611; UEE43011; UEE53011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	equipment — flameproof enclosures			extra-low voltage electrical/electronic equipment at AQF level 3 or equivalent. Example are (but not limited to): UEENEEG160A; MEM15020C		
UEENEEM033A	Overhaul and repair of explosion-protected equipment — gas atmospheres	60	3	Competencies in overhaul and repair of general low-voltage or extra-low voltage electrical/electronic equipment at AQF level 3 or equivalent. Example are (but not limited to): UEENEEG160A; MEM15020C		UEE33011; UEE42611; UEE43011; UEE53011
UEENEEM034A	Overhaul and repair of explosion-protected equipment — dust atmospheres	40	3	Competencies in overhaul and repair of general low-voltage or extra-low voltage electrical/electronic equipment at AQF level 3 or equivalent. Example are (but not limited to): UEENEEG160A; MEM15020C		UEE33011; UEE42611; UEE43011; UEE53011
UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment — coal	40	5	Competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing at		UEE50411; UEE53011; UEE60611; UEE61211; UEE62311; UEE63011

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	mining			AQF 5 or equivalent. Example are (but not limited to): C004B; E015B; E084A; E124A.		
UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment — gas atmospheres	40	5	Competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing at AQF 5 or equivalent. Example are (but not limited to): C004B; E015B; E084A; E124A.		UEE50411; UEE53011; UEE60611; UEE61211; UEE62211; UEE62311; UEE63011
UEENEEM037A	Conduct a conformity assessment of explosion-protected equipment — dust atmospheres	40	5	Competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing at AQF 5 or equivalent. Example are (but not limited to): C004B; E015B; E084A; E124A.		UEE50411; UEE53011; UEE60611; UEE61211; UEE63011
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40	4	M080A and competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or		UEE30811; UEE40311; UEE40411; UEE40611; UEE42211; UEE42611; UEE50411; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511;

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				equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH162A; UEENEEI112A; UEENEEF111A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE62311; UEE63011
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40	4	M080A and competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH162A; UEENEEI112A; UEENEEF111A; Competency required by a given		UEE30811; UEE40311; UEE40411; UEE40611; UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE62211; UEE63011

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				industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40	4	M080A and competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH162A; UEENEEI112A; UEENEEF111A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to)		UEE30811; UEE40311; UEE40411; UEE40611; UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE61511

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				G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM041A	Conduct testing of hazardous area installations - pressurisation	40	4	M080A and competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEI112A; MEM7001B Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE30811; UEE40311; UEE40411; UEE40611; UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE61511
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40	4	M080A and competencies in conducting testing of general electrical, electronic,		UEE30811; UEE40311; UEE40411; UEE40611; UEE40811; UEE42211;

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				instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH162A; UEENEEI112A; UEENEEF111A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE42611; UEE43011; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE62211; UEE62311; UEE63011
UEENEEM043A	Conduct detailed inspection of hazardous areas installations - coal mining	40	4	M023A; or M027A; or (M080A and M054A) or (M080A and G123A) M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring		UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE61511; UEE62311

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B Or M024A; or competencies in planning electrical / instrument installations at AQF level 4 or equivalent Examples are (but not limited to): G125A; I112A; Or G122A; G105A; E101A; E102A; E103A; E104A; E105A; E107A; E108A;		

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				E033B; G101A; G102A; G103A; G104A; G107A; G108A; G109A; and elective units as required from a Schedule 3 to a Strand Unit value of 6		
UEENEEM044A	Conduct detailed inspection of hazardous areas installations - gas atmospheres	40	4	M024A; or M028A; or (M080A and M054A) or (M080A and G023B) M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF114A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE62211; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				Or M024A; or competencies in planning electrical / instrument installations at AQF level 4 or equivalent Examples are (but not limited to): G125A; I112A; Or G122A; G105A; E101A; E102A; E103A; E104A; E105A; E107A; E108A; E033B; G101A; G102A; G103A; G104A; G107A; G108A; G109A; and elective units as required from a Schedule 3 to a Strand Unit value of 6		
UEENEEM045A	Conduct detailed inspection of hazardous areas installations - dust atmospheres	40	4	M025A; or M029A; or (M080A and M054A) or (M080A and G023B) M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent.		UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE61511

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF114A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B Or M024A; or competencies in planning electrical / instrument installations at AQF level 4 or equivalent Examples are (but not limited to): G025B; I112A; Or G122A; G105A; E101A; E102A; E103A; E104A; E105A; E107A; E108A; E033B; G101A; G102A; G103A;		

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G104A; G107A; G108A; G109A; and elective units as required from a Schedule 3 to a Strand Unit value of 6		
UEENEEM046A	Conduct detailed inspection of hazardous areas installations - pressurisation	40	4	M026A; or M030A; or (M080A and M054A) or (M080A and G023B) M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE61511

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				Or M024A; or competencies in planning electrical / instrument installations at AQF level 4 or equivalent Examples are (but not limited to): G025B; I112A; Or G122A; G105A; E101A; E102A; E103A; E104A; E105A; E107A; E108A; E033B; G101A; G102A; G103A; G104A; G107A; G108A; G109A; and elective units as required from a Schedule 3 to a Strand Unit value of 6		
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	20	4	M027A; or (M075A; and E010B) M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A;		UEE42611; UEE43011; UEE43011; UEE53011; UEE60611; UEE61211; UEE62211; UEE62311; UEE63011

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				UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B Or Competency in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to): E015B or G130A or I123A		
UEENEEM048A	Develop and manage maintenance programs for hazardous areas electrical equipment — gas atmospheres	20	4	M028A; or (M080A; and E110A) M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A;		UEE42611; UEE43011; UEE43011; UEE53011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM049A	Develop and manage maintenance programs for hazardous areas electrical equipment — dust atmospheres	20	4	M029A; or (M080A; and E110A) M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or		UEE42611; UEE43011; UEE43011; UEE53011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM050A	Develop and manage maintenance programs for hazardous areas electrical equipment — pressurisation	20	4	M030A; or (M080A; and E110A) M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE42611; UEE43011; UEE43011; UEE53011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEM052A	Classify hazardous areas — gas atmospheres	40	6	Competencies in gathering and analysing technical data at AQF6 or equivalent Examples are (but not limited to): E071B; E075B; R002B		UEE60611; UEE61211; UEE62111; UEE62211; UEE63011
UEENEEM053A	Classify hazardous areas — dust atmospheres	40	6	Competencies in gathering and analysing technical data at AQF6 or equivalent Examples are (but not limited to): E071B; E075B; R002B		UEE60611; UEE61211; UEE61511; UEE62111; UEE63011
UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	20	4	M024A; or competencies in planning electrical / instrument installations at AQF level 4 or equivalent Examples are (but not limited to): G025B; I112A; M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A;		UEE42611; UEE43011; UEE53011; UEE60611; UEE61211; UEE62211; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM055A	Plan electrical installations for hazardous areas — dust atmospheres	20	4	M025A; or competencies in planning electrical / instrument installations at AQF level 4 or equivalent Examples are (but not limited to): G125A; I112A; M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A;		UEE42611; UEE43011; UEE53011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM056A	Plan electrical installations for hazardous areas — pressurisation	20	4	M026A; or competencies in planning electrical / instrument installations at AQF level 4 or equivalent Examples are (but not limited to): G125A; I112A; M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or		UEE42611; UEE43011; UEE53011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM057A	Design explosion-protected electrical systems and installations — gas atmospheres	20	6	Competencies in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to): E115A; G130A; I123A		UEE60611; UEE61211; UEE61511; UEE62111; UEE62211; UEE63011
UEENEEM058A	Design explosion-protected electrical systems and installations — dust atmospheres	20	6	Competencies in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to): E115A; G130A; I123A		UEE60611; UEE61211; UEE61511; UEE62111; UEE63011
UEENEEM059A	Design explosion-protected electrical systems and installations — pressurisation	20	6	Competencies in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to): E115A; G130A; I123A		UEE60611; UEE61211; UEE61511; UEE62111; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEM060A	Carry out overhaul and repair of explosion-protected equipment — coal mining	60	3	Competency in general electrical, electronic, and/or mechanical equipment repair job function at AQF 3 or higher. Examples are (but not limited to): G129A; G164A; MEM7001B		UEE33011; UEE42611; UEE43011; UEE53011
UEENEEM061A	Carry out overhaul and repair of explosion-protected equipment — flameproof enclosures	60	3	Competency in general electrical, electronic, and/or mechanical equipment repair job function at AQF 3 or higher. Examples are (but not limited to): G129A; G164A; MEM7001B		UEE33011; UEE42611;UEE43011; UEE53011
UEENEEM062A	Carry out overhaul and repair of explosion-protected equipment — gas atmospheres	60	3	Competency in general electrical, electronic, and/or mechanical equipment repair job function at AQF 3 or higher. Examples are (but not limited to): G129A; G164A; MEM7001B		UEE33011; UEE42611; UEE43011; UEE53011
UEENEEM063A	Carry out overhaul and repair of explosion-protected equipment — dust	60	3	Competency in general electrical, electronic, and/or mechanical equipment repair job function at AQF 3 or higher. Examples are (but		UEE33011; UEE42611; UEE43011; UEE53011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	atmospheres			not limited to): G129A; G164A; MEM7001B		
UEENEEM064A	Conduct audit of hazardous areas installations — coal mining	60	5	Competency in engineering auditing/evaluation AQF 5 or equivalent. Examples are (but not limited to): G131A; G160A;		UEE50411; UEE53011; UEE60611; UEE61211; UEE62311; UEE63011
UEENEEM065A	Conduct audit of hazardous areas installations — gas atmospheres	60	5	Competency in engineering auditing/evaluation AQF 5 or equivalent. Examples are (but not limited to): G131A; G160A;		UEE50411; UEE53011; UEE60611; UEE61211; UEE62211; UEE63011
UEENEEM066A	Conduct audit of hazardous areas installations — dust atmospheres	60	5	Competency in engineering auditing/evaluation AQF 5 or equivalent. Examples are (but not limited to): G131A; G160A;		UEE50411; UEE53011; UEE60611; UEE61211; UEE63011
UEENEEM067A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — coal	60	5	M035A; M043A; M064A Competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing at		UEE50411; UEE53011; UEE60611; UEE61211; UEE62311; UEE63011

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	mining			AQF 5 or equivalent. Example are (but not limited to): C004B; E115A; E116A; E124A. And M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B Or M024A; or competencies in planning electrical / instrument		

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				installations at AQF level 4 or equivalent Examples are (but not limited to): G025B; I112A; Or G122A; G105A; E101A; E102A; E103A; E104A; E105A; E107A; E108A; E033B; G101A; G102A; G103A; G104A; G107A; G108A; G109A; and elective units as required from a Schedule 3 to a Strand Unit value of 6 And Competency in engineering auditing/evaluation AQF 5 or equivalent. Examples are (but not limited to): G131A; G160A;		
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected	60	5	M036A; M044A; M065A Competencies in compliance assessment of electrical / electronic equipment and general technical		UEE50411; UEE53011; UEE60611; UEE61211; UEE61511; UEE62111; UEE62211; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	equipment — gas atmospheres			evaluation and report writing at AQF 5 or equivalent. Example are (but not limited to): C004B; E115A; E116A; E124A. And M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B Or M024A; or competencies in		

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				planning electrical / instrument installations at AQF level 4 or equivalent Examples are (but not limited to): G125A; I112A; Or G122A; G105A; E101A; E102A; E103A; E104A; E105A; E107A; E108A; E033B; G101A; G102A; G103A; G104A; G107A; G108A; G109A; and elective units as required from a Schedule 3 to a Strand Unit value of 6 And Competency in engineering auditing/evaluation AQF 5 or equivalent. Examples are (but not limited to): G131A; G160A;		
UEENEEM069A	Assess the fitness-for-purpose of hazardous areas	60	5	M037A; M045A; M066A; Competencies in compliance assessment of electrical / electronic		UEE50411; UEE53011; UEE60611; UEE61211; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	explosion-protected equipment — dust atmospheres			equipment and general technical evaluation and report writing at AQF 5 or equivalent. Example are (but not limited to): C004B; E115A; E116A; E124A. And M080Aand competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B Or		

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				M024A; or competencies in planning electrical / instrument installations at AQF level 4 or equivalent Examples are (but not limited to): G125A; I112A; Or G122A; G105A; E101A; E102A; E103A; E104A; E105A; E107A; E108A; E033B; G101A; G102A; G103A; G104A; G107A; G108A; G109A; and elective units as required from a Schedule 3 to a Strand Unit value of 6 And Competency in engineering auditing/evaluation AQF 5 or equivalent. Examples are (but not limited to): G131A; G160A;		
UEENEEM070A	Repair reeling, trailing and flexible cables	60	2	None		UEE33011; UEE42611; UEE43011; UEE53011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEM071A	Test reeling, trailing and flexible cables	60	2	None		UEE33011; UEE42611; UEE43011; UEE53011
UEENEEM072A	Inspect and fit plugs/couplers for reeling, trailing and flexible cables	60	2	None		UEE33011; UEE42611; UEE43011; UEE53011
UEENEEM073A	Verify compliance of repaired reeling, trailing and flexible cables	60	3	M070A; M071A; M072A		UEE33011; UEE42611; UEE43011; UEE53011
UEENEEM074A	Plan electrical installations in hazardous areas — Coal mining	20	4	M023A Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent. Examples are (but not limited to): G025B or I112B M080Aand competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF104A; Competency required by a given		UEE42611; UEE43011; UEE53011; UEE62311

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		
UEENEEM075A	Design explosion-protected electrical systems — Coal mining	20	6	Competency in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to): E115A or G030B or I123A		UEE60611; UEE61211; UEE61511; UEE62111; UEE63011
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20	3	UEENEEM080A and Competencies required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent		UEE30811; UEE31211; UEE33011; UEE40411; UEE40611; UEE40911; UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE61511
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20	3	M023A or M024A or M025A or M027A or M028A or M029A or		UEE30811; UEE31011; UEE31211; UEE33011; UEE40411; UEE40611;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				M080A M080A and competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to): UEENEEG105A; UEENEEH150A; UEENEEI112A; UEENEEF114A; Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B		UEE40811; UEE40911; UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE61511
UEENEEM078A	Manage compliance of hazardous areas	20	4	Competency in general plant management at AQF level 4 Example is (but not limited to) PMASUP410A		UEE42211; UEE42611; UEE43011; UEE51011; UEE53011; UEE60611; UEE61211; UEE61511; UEE62211; UEE62311; UEE63011

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEM079A	Design of gas detection systems	20	6	M057A or M0058A or M059A Competencies in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to): E115A; G130A; I123A		UEE60611; UEE61211; UEE61511; UEE62111; UEE63011
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20	2	Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to) G105A; I112A; MEM7001B; PMAOPS201B	UEE42611	UEE30811; UEE31011; UEE31211; UEE33011; UEE40311; UEE40411; UEE40611; UEE40811; UEE40911; UEE42211; UEE43011; UEE43211; UEE51011; UEE53011; UEE60611; UEE61111; UEE61211; UEE61511; UEE62211; UEE62311; UEE63011

N - Rail units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEN101A	Maintain mechanical rail signalling equipment and	20	4	E101A		UEE41211

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	infrastructure					
UEENEEN102A	Assemble and wire internal electrical rail signalling equipment	30	3	G104A; and work place requirements in 'Work site protection' have been acquired. E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G106A; G107A; G108A; G109A;	UEE41211	UEE30811
UEENEEN103A	Install and maintain rail track circuit leads and bonds	30	3	N102A; and work place requirements in 'Work site protection' have been acquired. E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;	UEE41211	UEE30811
UEENEEN104A	Test copper rail signalling cables	20	3	N121A; N102A; G063A; G106A; G102A; G101A; E107A; E104A; E102A; E101A. and work place requirements in 'Work site protection' have been acquired.	UEE41211	UEE30811
UEENEEN105A	Install and maintain rail signalling power supplies	40	4	N102A; and work place requirements in 'Work site protection' have been acquired. E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A;	UEE41211	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G107A; G108A; G109A;		
UEENEEN106A	Install and maintain non-vital screen based control systems	20	4	E101A and work place requirements in 'Work site protection' have been acquired.		UEE41211
UEENEEN107A	Install and maintain active level crossing equipment	40	4	N109A and work place requirements in 'Work site protection' have been acquired. N103A; N105A; N102A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;	UEE41211	
UEENEEN108A	Install and maintain power operated point actuating devices	40	4	N109A and work place requirements in 'Work site protection' have been acquired. N103A; N105A; N102A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;	UEE41211	
UEENEEN109A	Install and maintain train detection equipment	40	4	N103A; N105A and work place requirements in 'Work site protection' have been acquired. N102A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A;	UEE41211	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G106A; G107A; G108A; G109A;		
UEENEEN110A	Install and maintain non-vital telemetry systems	40	4	E101A and work place requirements in 'Work site protection' have been acquired.		UEE41211
UEENEEN111A	Install and maintain trackside signal and train protection equipment	40	4	N109A and work place requirements in 'Work site protection' have been acquired. N103A; N105A; N102A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;	UEE41211	
UEENEEN112A	Install and maintain vital relay interlocking systems	40	4	N107A: N108A; N111A and work place requirements in 'Work site protection' have been acquired. N109A and work place requirements in 'Work site protection' have been acquired. N109A; N103A; N105A; N102A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;	UEE41211	
UEENEEN114A	Install and maintain computer	30	4	N107A; N108A; N109A and work place requirements in 'Work site protection' have		UEE41211

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	based interlocking rail systems			been acquired. N109A; N103A; N105A; N102A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;		
UEENEEN116A	Maintain electronic and microprocessor-based remote control systems	20	4	Relevant work place requirements in 'Work site protection' have been acquired.	UEE41211	
UEENEEN118A	Find and repair rail signalling system faults	20	4	N112A; or N114A and work place requirements in 'Work site protection' have been acquired. N107A; N108A; N109A; N103A; N105A; N102A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A; G101A; G102A; G103A; G104A; G106A; G107A; G108A; G109A;	UEE41211	
UEENEEN121A	Repair rail signalling power and control cables	40	3	N102A and Work place requirements in 'Work site protection' have been acquired. G104A; E101A; E102A; E104A; E105A; E107A; E137A; G006A; G033A; G063A;	UEE41211	UEE30811

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
				G101A; G102A; G103A; G106A; G107A; G108A; G109A;		
UEENEEN126A	Develop rail signalling system maintenance programs	20	4	Relevant work place requirements in 'Work site protection' have been acquired.		UEE41211
UEENEEN127A	Decommission electrical and electro-mechanical rail signalling from service	20	4	Relevant work place requirements in 'Work site protection' have been acquired.		UEE41211
UEENEEN128A	Test and commission rail power equipment	20	4	Relevant work place requirements in 'Work site protection' have been acquired.		UEE41211

P - Restricted units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEP010A	Disconnect - reconnect appliances connected to low voltage installation wiring	60	3	E101A Competencies needed for emergency services and equipment repair.		UEE30911
UEENEEP011A	Disconnect - reconnect neon signs connected to low voltage	60	3	E101A Competencies needed for		

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	installation wiring			emergency services and equipment repair.		
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	60	3	E101A Competencies needed for emergency services and equipment repair.	UEE32111; UEE32211; UEE42711; UEE42811; UEE42911; UEE51211; UEE62511	
UEENEEP013A	Disconnect - reconnect control devices connected to low voltage installation wiring	60	3	E101A Competencies needed for emergency services and equipment repair.	UEE30711; UEE31211; UEE42211; UEE51011; UEE61511	UEE31011
UEENEEP014A	Disconnect - reconnect water heaters connected to low voltage installation wiring	60	3	E101A Competencies needed for emergency services and equipment repair.		
UEENEEP015A	Disconnect - reconnect motors connected to low voltage installation wiring	60	3	E101A Competencies needed for emergency services and equipment repair.	UEE30611	

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEEP016A	Locate and rectify faults in low voltage appliances using set procedures	20	3	P010A; E101A		
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	20	3	P012A; E101A	UEE32111; UEE32211; UEE42711; UEE42811; UEE42911; UEE51211; UEE62511	
UEENEEP018A	Locate and rectify faults in low voltage control devices using set procedures	20	3	P013A; E101A		UEE30711; UEE31011
UEENEEP019A	Locate and rectify faults in low voltage water heaters using set procedures	20	3	P014A; E101A		
UEENEEP020A	Locate and rectify faults in low voltage motors using set procedures	20	3	P015A; E101A		UEE30611
UEENEEP021A	Disconnect - reconnect explosion-protected appliances and control devices connected	60	3	P013A; E101A		

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
	to low voltage installation wiring					
UEENEEP022A	Disconnect and reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles	60	3	Competencies needed for mechanical maintenance of HV electric propulsion components off-road earth moving trucks.		
UEENEEP023A	HV Flexible Cables and Plugs	40	3	P025A; P024A; E101A		
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20	2	E101A	UEE32111; UEE32211; UEE42711; UEE42811; UEE42911; UEE51211; UEE62511	UEE20111; UEE21311; UEE21711; UEE22011; UEE22111; UEE30611; UEE30911; UEE32011; UEE41611; UEE43211; UEE61111; UEE62011
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20	3	P024A; E101A	UEE32111; UEE32211; UEE42711; UEE42811; UEE42911; UEE51211;	UEE30611; UEE30911; UEE32011; UEE40711; UEE41611; UEE43211; UEE50511; UEE60211; UEE61111;

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Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
					UEE62511	
UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20	2	E101A		UEE20111; UEE20811; UEE21311; UEE32011; UEE41611; UEE43211; UEE61111; UEE62011

R - Research units

Unit Code	Unit Title	Wtg. Pts	AQF Level	Prerequisite/s	Qualification Core	Qualification Elective
UEENEER001B	Contribute to the planning of a research project	120	5	None	UEE50811	
UEENEER002B	Contribute to the conduct of a research project	120	5	None	UEE50811	
UEENEER003B	Contribute to the development of a product/application/ service	120	5	None	UEE50811	
UEENEER004B	Contribute to the trial of a product/application/ service	120	5	None	UEE50811	
UEENEER005B	Contribute to Intellectual Property management	120	5	None		UEE50811
UEENEER006B	Contribute to the commercialisation of products/applications/ services	120	5	None		UEE50811

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Imported Units

Unit Code	Unit Title	Weighting Points
BSBCUS401B	Coordinate implementation of customer service strategies	40
BSBINM401A	Implement workplace information system	40
BSBINM501A	Manage an information or knowledge management system	50
BSBINN301A	Promote innovation in a team environment	40
BSBINN502A	Build and sustain an innovative work environment	50
BSBLED401A	Develop teams and individuals	40
BSBMGT402A	Implement operational plan	40
BSBMGT403A	Implement continuous improvement	40
BSBMGT502B	Manage people performance	70
BSBMGT516C	Facilitate continuous improvement	60
BSBWOR401A	Establish effective workplace relationships	50
BSBWOR402A	Promote team effectiveness	50
BSBWOR404B	Develop Work Priorities	40

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BSBWOR502B	Ensure team effectiveness	60
CPCCOHS1001A	Work safely in the construction industry	10
CPCPCM2043A	Carry out WHS requirements	10
CPCPMS3035A	Install and test ducting systems	10
CPPBDN5013A	Develop and collaborate on building information models for small-scale building design projects	100
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
ICTTEN2207A	Install and configure a home or small office network	60
ICTTEN2208A	Install and configure a small to medium business network	60
ICTTEN2209A	Build and maintain a secure network	80
ICTTEN3056A	Install telecommunications network equipment	40
ICTTEN4210A	Implement and troubleshoot enterprise routers and switches	100
ICTTEN4211A	Design, install and configure an internetwork	100
ICTTEN4212A	Apply advanced routing protocols to network design	80
ICTTEN4213A	Configure and troubleshoot advanced network switching	80

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ICTTEN4214A	Install and maintain a wide area network	80
MSS402001A	Apply competitive systems and practices	20
MSS402020A	Apply quick changeover procedures	20
MSS402021A	Apply Just in Time procedures	20
MSS402040A	Apply 5S procedures	20
MSS402080A	Undertake root cause analysis	20
MSS402081A	Contribute to the application of a proactive maintenance strategy	20
MEM05007C	Perform manual heating and thermal cutting	20
MEM05012C	Perform routine manual metal arc welding	20
MEM16006A	Organise and communicate information	20
MEM16008A	Interact with computing technology	20
MEM30001A	Use computer aided drafting systems to produce basic engineering drawings	40
MEM30002A	Produce basic engineering graphics	40
MEM30003A	Produce detailed engineering drawings	40
MEM30004A	Use CAD to create and display 3D models	40

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NWP209B	Use maps, plans, drawings and specifications	30
NWP210B	Perform basic water quality tests	20
NWP218B	Perform and record sampling	20
NWP226B	Prepare and restore work site	30
NWP227B	Control vegetation on a site	20
NWP229B	Repair minor structures	20
NWP243B	Operate bore fields and groundwater source systems	20
NWP245B	Maintain tanks and water storage assets	30
NWP247A	Maintain catchment and surrounding areas	40
NWP253B	Install and repair water services	40
NWP255B	Maintain and repair wastewater collection assets	20
NWP256B	Monitor and report water distribution systems	30
NWP257B	Maintain and repair wastewater collection systems	30
NWP259B	Operate, monitor and maintain pump stations	30
NWP260A	Monitor and report water treatment processes	30

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NWP261A	Operate and maintain water treatment plant and equipment	30
NWP262A	Monitor and report wastewater treatment processes	30
NWP263A	Operate and maintain wastewater treatment plant and equipment	30
NWP268B	Monitor, operate and report chlorine disinfection systems	30
NWP276A	Monitor, operate and report fluoridation processes	20
PMASUP410B	Develop plant documentation	30
CPPFES2043A	Prevent ozone depleting substance and synthetic greenhouse gas emissions	10
RIIRAI609D	Establish and maintain electrical installations, reticulation and protection system	120
RIIRIS601D	Establish and maintain the risk management system	100
RIIWHS202D	Enter and work in confined spaces	30
RIIWHS204D	Work safely at heights	20
RIIWHS205D	Control traffic with stop-slow bat	10
TLILIC2001A	Licence to operate a forklift truck	40
TLIS2004A	Install and maintain rail bonding systems	40
UEPOPS202B	Apply Quality Systems To Work	20

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UEPOPS337B	Maintain Quality Systems within the Team	20
UEPOPS416B	Monitor the implementation of the enterprise's production-maintenance quality control procedures	20
UETTDRIS43A	Perform low voltage field switching operation to a given schedule	50
UETTDRIS44A	Perform HV field switching operation to a given schedule	40
UETTDRIS47A	Sample, test, filter and reinstate insulating oil	40
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus	60
UETTDRIS70A	Diagnose and rectify faults in electrical energy distribution systems	60
UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission systems	60
UETTDRIS72A	Diagnose and rectify faults in distributed Generation systems	60
UETTDRIS73A	Develop engineering solutions for energy supply power transformer problems	60
UETTDRIS74A	Develop engineering solutions for energy supply system protection problems	60
UETTDRSB23A	Install and maintain substation direct current systems	30
UETTDRSB29A	Maintain capacitor bank equipment for voltage regulation	40

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UETTDRSB39A	Perform power system substation switching operation to a given schedule	50

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1.2.09 Unit Relationships UEE11 V1 to UEE07 V4

2.9 Unit relationships UEE11 V1 to UEE07 v4

Table 1 Relationship of UEE11 Electrotechnology Training Package V1 to UEE07 Version4.

This table maps relationship between units which have been replaced, removed or added in UEE11 Electrotechnology Training PackageV1. All units not listed in this table remain unchanged in UEE11 V1. Please consult the mapping tables for previous versions below for information on these units.

Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
A – Assembly units				
UEENEEA101A	Assemble electronic components	UEENEEA001B	Assemble electronic apparatus	E
UEENEEA102A	Select electronic components for assembly	UEENEEA002B	Select electronic components	E
UEENEEA103A	Set up and check electronic component assembly machines	UEENEEA003B	Set up and check electronic component placement machines	E
UEENEEA10	Modify electronic sub	UEENEEA00	Rework electronic	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
4A	assemblies	4B	sub assemblies	
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	UEENEEA005B	Conduct functional and quality tests on assembled electronic apparatus	E
UEENEEA106A	Use lead-free soldering techniques	UEENEEA006B	Apply lead-free soldering techniques	E
UEENEEA107A	Make up wiring looms for internal wiring of appliances and machinery		New Unit	
UEENEEA110A	Assemble, mount and connect control gear and switchgear	UEENEEA010B	Assemble, mount and connect switchgear and controlgear	E
UEENEEA112A	Fabricate and assemble bus bars	UEENEEA012B	Make up and assemble bus bars	E
UEENEEA113A	Mount and wire control panel equipment	UEENEEA013B	Assemble and wire control panels	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
B – Broadcast technology units				
UEENEEB101A	Operate and maintain amateur radio communication stations	UEENEEB001B	Operate and maintain an amateur radio communication station	E
C – Commercial units				
	Removed	UEENEEC015B	Participate in custom electronic installations work and competency development activities	
	Removed	UEENEEC028B	Participate in hazardous areas work and competency development activities	
	Removed	UEENEEC029B	Participate in explosion-protected equipment overhaul	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			work and competency development activities	
D – Computerised Systems units				
UEENEED101A	Use computer applications relevant to a workplace	UEENEED001B	Use basic computer applications relevant to a workplace	E
UEENEED102A	Assemble, set-up and test computing devices	UEENEED002B	Assemble, set up and test personal computers	E
UEENEED103A	Evaluate and modify object oriented code programs	UEENEED003B	Evaluate and modify programs written in object oriented code	E
UEENEED104A	Use engineering applications software on personal computers	UEENEED004B	Use engineering applications software	E
	Removed	UEENEED005B	Enter and verify operating instructions in microprocessor	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			equipped devices	
	Removed	UEENEED007B	Develop, enter and verify programs for programmable logic controllers using ladder instruction set	
	Removed	UEENEED008B	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	
	Removed	UEENEED009B	Develop, enter and verify programs for industrial control systems using high level instructions	
UEENEED110A	Set up, create and implement content for a web server	UEENEED010B	Set up and create content for a web server	E
UEENEED111A	Develop, implement and test object	UEENEED011B	Develop object oriented code	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	oriented code			
UEENEED112A	Support computer hardware and software for engineering applications	UEENEED012B	Support computer hardware and software	E
UEENEED113A	Install and administer Unix based networked computers	UEENEED013B	Install and administer Unix based computers	E
UEENEED114A	Design and manage enterprise computer networks	UEENEED014B	Design and manage enterprise networks	E
UEENEED115A	Administer computer networks	UEENEED015B	Administer user networks	E
UEENEED116A	Develop computer network services	UEENEED016B	Develop network services	E
UEENEED117A	Install and configure network systems for internetworking	UEENEED017B	Install and configure Internetworking systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEED118A	Design and implement network systems for internetworking	UEENEED018B	Design and implement Internetworking systems	E
UEENEED119A	Design and implement advanced routing for internetworking systems	UEENEED019B	Design and implement Internetworking systems — advanced routing	E
UEENEED120A	Design and implement remote access for Internetworking systems	UEENEED020B	Design and implement Internetworking systems — remote access	E
UEENEED121A	Design and implement multi-layer switching for Internetworking systems	UEENEED021B	Design and implement Internetworking systems — multi-layer switching	E
UEENEED122A	Design and implement security	UEENEED022B	Design and implement	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	for Internetworking systems		Internetworking systems — security	
UEENEED123A	Design and implement wireless LANs/WANs for internetworking systems	UEENEED023B	Design and implement Internetworking systems — wireless LANs/WANs	E
UEENEED124A	Integrate multiple computer operating systems on a client server local area network	UEENEED024B	Integrate multiple computer operating systems on a client server network	E
	Removed	UEENEED025B	Design and configure Human-Machine Interface networks	
	Removed	UEENEED026B	Design a computer based control system	
	Removed	UEENEED027B	Develop structured programs to control external devices	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	Removed	UEENEED028B	Develop and test code for microcontroller devices	
UEENEED129A	Develop web pages for engineering applications	UEENEED029B	Develop basic web pages for engineering applications	E
UEENEED130A	Select, install, configure and test multimedia components	UEENEED030B	Select, install, configure and test multimedia devices	E
	Removed	UEENEED031B	Develop and validate basic integrated systems	
	Removed	UEENEED032B	Design integrated systems	
	Removed	UEENEED033B	Design complex integrated systems	
	Removed	UEENEED034B	Configure and maintain industrial control system	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			networks	
UEENEED143A	Install and configure a client computer operating system and software	UEENEED043B	Install and configure a computer operating system and software	E
UEENEED144A	Commission industrial computer systems	UEENEED044B	Commission computer systems	E
UEENEED145A	Modify-redesign of industrial computer systems	UEENEED045B	Modify-redesign of computer system	E
UEENEED146A	Set up and configure basic local area network (LAN)	UEENEED046B	Set up and configure basic local area network	E
UEENEED148A	Plan industrial computer systems projects	UEENEED048B	Plan computer systems projects	E
UEENEED150A	Develop industrial control programs for	UEENEED050B	Develop control programs for	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	microcomputer equipped devices		micro-computer equipped devices	
UEENEED151A	Provide programming solution for computer systems engineering problems	UEENEED051B	Provide programming solution for engineering problems	E
UEENEED152A	Design embedded controller control systems	UEENEED052B	Design embedded controller systems	E
UEENEED153A	Set up, configure and test biometric devices	UEENEED053B	Set up and test biometric devices	E
UEENEED154A	Analyse and implement biometric measuring techniques and applications	UEENEED054B	Analyse and implement biometric techniques and applications	E
UEENEED155A	Develop and validate biometric equipment/systems installation	UEENEED055B	Develop and validate biometric systems installation instructions	E
UEENEED14	Develop energy		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
7A	sector directory services			
UEENEED149A	Develop energy sector computer network applications infrastructure		New Unit	
E – Cross-discipline units				
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	UEENEEE001B	Apply OHS practices in the workplace	E
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	UEENEEE002B	Dismantle, assemble and fabricate electrotechnology components	E
UEENEEE103A	Solve problems in ELV single path circuits	UEENEEE003B	Solve problems in extra-low voltage single path circuits	E
UEENEEE10	Solve problems in	UEENEEE004	Solve problems in	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
4A	d.c. circuits	B	multiple path d.c. circuits	
UEENEEE105A	Fix and secure electrotechnology equipment	UEENEEE005B	Fix and secure equipment	E
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	UEENEEE007B	Use drawings, diagrams, schedules and manuals	E
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	UEENEEE008B	Lay wiring/cabling and terminate accessories for extra-low voltage circuits	E
UEENEEE110A	Develop and implement energy sector maintenance programs	UEENEEE010B	Develop and implement maintenance programs	E
UEENEEE114A	Supervise and coordinate energy sector work activities	UEENEEE014B	Supervise and coordinate work activities	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	Removed	UEENEEE016 B	Write specifications for electrotechnology projects	
UEENEEE117 A	Implement and monitor energy sector OHS policies and procedures	UEENEEE017 B	Implement and monitor OHS policies and procedures	E
UEENEEE118 A	Establish, maintain and evaluate energy sector OHS systems	UEENEEE018 B	Establish, maintain and evaluate OHS systems	E
UEENEEE119 A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	UEENEEE019 C	Solve problems in multiple path a.c. circuits	E
UEENEEE121 A	Plan an integrated cabling installation system	UEENEEE021 B	Plan an integrated cabling system	E
UEENEEE122 A	Carry out preparatory energy sector work activities	UEENEEE022 B	Carry out preparatory electrotechnology work activities	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	UEENEEE023B	Solve basic problems in electronic and digital equipment	E
UEENEEE124A	Compile and produce an energy sector detailed report	UEENEEE024C	Compile and produce an electrotechnology report	E
	Removed	UEENEEE025B	Solve problems in complex multiple path circuits	
	Removed	UEENEEE026B	Provide computational solutions to basic engineering problems	
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	UEENEEE027B	Use advanced computational processes to provide solutions to engineering problems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEE128A	Develop engineering solutions to photonic system problems	UEENEEE028B	Develop engineering solutions to photonic problems	E
UEENEEE129A	Solve electrotechnical engineering problems	UEENEEE029B	Solve electrotechnical problems	E
UEENEEE130A	Provide solutions and report on routine electrotechnology problems	UEENEEE030B	Provide solutions to and report on routine electrotechnology problems	E
	Removed	UEENEEE032B	Document occupational hazards and risks in computer systems	
	Removed	UEENEEE033B	Document occupational hazards and risks in electrical	
	Removed	UEENEEE034B	Document occupational hazards and risks in electronics	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	Removed	UEENEEE035 B	Document occupational hazards and risks in instrumentation	
	Removed	UEENEEE036 B	Document occupational hazards and risks in refrigeration and air-conditioning	
	Removed	UEENEEE037 B	Document occupational hazards and risks in electrotechnology	
UEENEEE141 A	Use of routine equipment/plant/technologies in an energy sector environment	UEENEEE041 B	Use of routine equipment/plant/technologies in an electrotechnology environment	E
UEENEEE142 A	Produce products for carrying out energy sector work activities	UEENEEE042 B	Produce routine products for carrying out electrotechnology	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			work activities	
UEENEEE143A	Produce routine tools/devices for carrying out energy sector work activities	UEENEEE043B	Produce routine tools/devices for carrying out electrotechnology work activities	E
UEENEEE144A	Apply technologies and concepts to energy sector work activities	UEENEEE044B	Apply technologies and concepts to electrotechnology work activities	E
UEENEEE145A	Apply computation when using equipment/materials/ concepts in an energy sector environment	UEENEEE045B	Apply computation when using equipment, materials and concepts in an electrotechnology environment	E
UEENEEE146A	Identify effects of energy on machinery and materials in an energy sector environment	UEENEEE046B	Identify affects of energy on machinery and materials in an electrotechnology environment	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEE147A	Identify building techniques, methods and materials used in energy sector work activities	UEENEEE047B	Identify building techniques, methods and materials used in electrotechnology work activities	E
UEENEEE148A	Carry out routine work activities in an energy sector environment	UEENEEE048C	Carry out routine work activities in an electrotechnology environment	E
UEENEEE149A	Contribute to the operation of support plant and equipment used in electricity supply industry	UEENEEE049B	Contribute to the operation of support plant and equipment used in electricity supply	E
UEENEEE150A	Undertake computations in an energy sector environment	UEENEEE050B	Undertake computations in an electrotechnology environment	E
UEENEEE151A	Transport apparatus, equipment and materials	UEENEEE051B	Transport apparatus and materials	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	UEENEEE060B	Provide solutions for uses of materials and thermodynamic effects	E
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	UEENEEE061B	Analyse static and dynamic parameters of equipment	E
UEENEEE162A	Select drive components for electrical equipment design	UEENEEE062B	Select drive components for equipment design	E
UEENEEE163A	Analyse materials for suitability in electrical equipment	UEENEEE063B	Analyse materials for suitability in equipment	E
UEENEEE164A	Design electrical machine drives and production layout plans	UEENEEE064B	Design machine drives and production layout plans	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	UEENEEE079A	Identify and select components, accessories and materials for electrotechnology work activities	E
UEENEEE103A	Solve problems in ELV single path circuits		New Unit	
UEENEEE131A	Solve problems in ELV circuits for non electrical workers		New Unit	
UEENEEE152A	Observe safety practices are followed in the vicinity of isolated electrical cables		New Unit	
UEENEEE185A	Write work activity reports		New Unit	
UEENEEE190	Prepare engineering drawings using		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
A	manual drafting and CAD for electrotechnology/utilities applications			
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software		New Unit	
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software		New Unit	
F – Data and voice communication units				
UEENEEF101A	Install and connect cabling for direct access to telecommunications		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	service			
UEENEEF102 A	Install and maintain cabling for multiple access to telecommunication services	UEENEEF002 B	Lay and connect cables for multiple access to telecommunication services	E
UEENEEF103 A	Install and maintain telecommunication cabling for services in lifts	UEENEEF003 B	Install and maintain cabling for telecommunication services in lifts	E
UEENEEF104 A	Install and modify performance data communication copper cabling	UEENEEF004 B	Install and modify performance data communication structured cabling	E
UEENEEF105 A	Install and modify optical fibre performance data communication cabling	UEENEEF005 B	Install and modify performance data communication optical fibre cabling	E
UEENEEF106	Solve problems in	UEENEEF006	Solve problems in	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
A	voice and data communications circuits	B	data and voice communications circuits	
UEENEEF107 A	Set up and configure the wireless capabilities of communications and data storage devices	UEENEEF007 B	Set up the wireless capabilities of communications and data storage devices	E
UEENEEF108 A	Select and arrange equipment for wireless communication networks	UEENEEF008 B	Select and arrange equipment for wireless networks	E
UEENEEF109 A	Install and connect data and voice communication equipment	UEENEEF009 B	Install and connect voice and data communications equipment	E
UEENEEF110 A	Select and arrange data and voice equipment for local area networks	UEENEEF010 B	Select and arrange equipment for local area networks	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEF111 A	Test, report and rectify faults in data and voice installations	UEENEEF011 B	Test, report and rectify faults in voice and data installations	E
UEENEEF112 A	Install aerial telecommunication cables	UEENEEF012 B	Install aerial communication cables	E
UEENEEF113 A	Install underground communication cables	UEENEEF013 B	Install below ground communication cables	E
UEENEEF114 A	Set up and configure basic data communication systems	UEENEEF014 B	Set up and configure basic data communications systems	E
UEENEEF115 A	Assemble and connect telecommunication frames and cabinets	UEENEEF015 B	Assemble and connect communication frames and cabinets	E
	Removed	UEENEEF016 A	Lay and connect cabling for direct access to	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			telecommunications services	
G – Electrical units				
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	UEENEEG001B	Solve problems in electromagnetic circuits	E
UEENEEG102A	Solve problems in low voltage a.c. circuits	UEENEEG002B	Solve problems in single and three phase low voltage circuits	E
UEENEEG103A	Install low voltage wiring and accessories	UEENEEG003B	Install wiring and accessories for low voltage circuits	E
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	UEENEEG004B	Install low voltage electrical apparatus and associated equipment	E
UEENEEG105A	Verify compliance and functionality of	UEENEEG005B	Verify compliance and functionality of	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	low voltage general electrical installations		general electrical installations	
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	UEENEEG007B	Select and arrange equipment for general electrical installations	E
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	UEENEEG008B	Find and repair faults in electrical apparatus and circuits	E
UEENEEG109A	Develop and connect electrical control circuits	UEENEEG009B	Develop and connect control circuits	E
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	UEENEEG010B	Find and repair faults in d.c. electrical apparatus and circuits	E
UEENEEG111A	Carry out basic repairs to electrical components and equipment	UEENEEG011B	Carry out basic repairs to electrical apparatus	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	Removed	UEENEEG012B	Solve fundamental problems in electrical systems	
UEENEEG113A	Install and maintain emergency safety systems	UEENEEG013B	Install and maintain emergency systems	E
	Removed	UEENEEG015B	Find and rectify faults in energy supply network equipment	
UEENEEG116A	Diagnose and rectify faults in traction lift systems	UEENEEG016B	Diagnose and rectify faults in lift systems	E
UEENEEG118A	Maintain operation of electrical mining equipment and systems	UEENEEG018B	Maintain operation of electrical mining equipment	E
UEENEEG119A	Maintain operation of electrical marine equipment and systems	UEENEEG019B	Maintain operation of electrical marine equipment	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEG120A	Select and arrange equipment for special LV electrical installations	UEENEEG020B	Select and arrange equipment for special electrical installations	E
UEENEEG121A	Verify compliance and functionality of special LV electrical installations	UEENEEG021B	Verify compliance and functionality of special electrical installations	E
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	UEENEEG022B	Conduct compliance inspection of single phase electrical installations	E
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	UEENEEG023B	Conduct compliance inspection of electrical installations with demand exceeding 100 A per phase	E
UEENEEG124A	Conduct compliance inspection of special LV electrical	UEENEEG024B	Conduct compliance inspection of special electrical installations	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	installations			
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	UEENEEG025B	Plan electrical installations with a LV demand up to 400 A per phase	E
UEENEEG126A	Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	UEENEEG026B	Install and maintain field power and distribution systems with a LV demand up to 200 A per phase	E
UEENEEG127A	Design electrical installations with a low voltage demand greater than 400 A per phase	UEENEEG027B	Design electrical installations with a LV demand greater than 400 A per phase	E
UEENEEG128A	Plan low voltage switchboard and control panel layouts	UEENEEG028B	Plan switchboard and control panel layouts	E
UEENEEG129A	Overhaul and repair major switchgear and	UEENEEG029B	Overhaul and repair major	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	controlgear		switchgear/controlgear	
UEENEEG130A	Design switchboards rated for high fault levels (greater than 400 A)	UEENEEG030B	Design switchboards rated for high fault levels	E
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	UEENEEG031B	Evaluate performance of electrical apparatus	E
UEENEEG132A	Carry out low voltage electrical field testing and report findings	UEENEEG032B	Carry out electrical field testing and report findings	E
	Removed	UEENEEG034B	Perform high voltage field switching to a given schedule	
	Removed	UEENEEG035B	Diagnose and rectify faults in a.c. motor drive systems	
	Removed	UEENEEG036B	Diagnose and rectify faults in d.c. motor	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			drive systems	
	Removed	UEENEEG037B	Diagnose and rectify faults in energy supply apparatus	
	Removed	UEENEEG038B	Diagnose and rectify faults in electrical energy distribution systems	
	Removed	UEENEEG039B	Diagnose and rectify faults in distributed generation systems	
	Removed	UEENEEG040B	Develop engineering solutions for energy supply power transformer problems	
	Removed	UEENEEG041B	Diagnose and rectify faults in servo drive systems	
	Removed	UEENEEG04	Diagnose and rectify	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
		2B	faults in electrical energy supply transmission systems	
UEENEEG143A	Develop engineering solution for synchronous machine and control problems	UEENEEG043B	Develop engineering solution for synchronous machine problems	E
UEENEEG144A	Develop engineering solutions for d.c. machine and control problems	UEENEEG044B	Develop engineering solutions for d.c. machine problems	E
UEENEEG145A	Develop engineering solutions for induction machine and control problems	UEENEEG045B	Develop engineering solutions for induction motor problems	E
	Removed	UEENEEG046B	Develop engineering solutions for energy supply system protection problems	
	Removed	UEENEEG047B	Provide computational	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			solutions to power engineering problems	
	Removed	UEENEEG048B	Solve problems in complex multiple path power circuits	
	Removed	UEENEEG049B	Solve problems in complex polyphase power circuits	
UEENEEG150A	Wind electrical coils	UEENEEG050B	Wind coils	E
UEENEEG151A	Place and connect electrical coils	UEENEEG051B	Place and connect coils	E
UEENEEG152A	Rewind single phase machines	UEENEEG052B	Rewind single phase induction machines	E
UEENEEG153A	Rewind three phase low voltage induction machines	UEENEEG053B	Rewind three phase induction machines rated for low voltage	E
UEENEEG154A	Rewind LV direct current machines	UEENEEG054B	Rewind direct current machines rated for	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			low voltage	
UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV	UEENEEG055B	Rewind three phase induction machines rated for high voltage to 3.3 kV	E
UEENEEG156A	Rewind HV three phase induction machines rated for voltages above 3.3 kV	UEENEEG056B	Rewind three phase induction machines rated for high voltage above 3.3 kV	E
UEENEEG157A	Conduct electrical tests on LV electrical machines	UEENEEG057B	Conduct electrical tests on low voltage electrical machines	E
UEENEEG158A	Conduct electrical tests on HV electrical machines	UEENEEG058B	Conduct electrical tests on high voltage electrical machines	E
UEENEEG159A	Conduct mechanical tests on electrical machines and components	UEENEEG059B	Conduct mechanical tests on electrical machines	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEG160A	Evaluate performance of LV electrical machines	UEENEEG060B	Evaluate performance of electrical machines	E
UEENEEG161A	Design and develop modifications to LV electrical machines	UEENEEG061B	Design and develop modifications to electrical machines	E
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	UEENEEG062B	Set up and place electrical apparatus and associated circuits into service	E
UEENEEG164A	Repair and maintain mechanical components of electrical machines	UEENEEG064B	Repair mechanical components of electrical machines	E
UEENEEG165A	Maintain and service traction lifts systems and equipment	UEENEEG065B	Maintain and service traction lifts	E
UEENEEG166A	Install and maintain escalators, moving walks and treadways	UEENEEG066B	Installation and maintenance of escalators, moving	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			walks and tread ways	
UEENEEG167A	Align and install traction lift equipment	UEENEEG067B	Align and install lift equipment	E
UEENEEG168A	Diagnose and rectify faults in complex lift systems	UEENEEG068B	Diagnose and rectify faults in complex lift systems	E
UEENEEG169A	Manage large electrical projects	UEENEEG069B	Manage electrical projects	E
UEENEEG170A	Plan large electrical projects	UEENEEG070B	Plan electrical projects	E
	Removed	UEENEEG071C	Install and set up interval metering	
UEENEEG172A	Investigate and report on electrical incidents and causes	UEENEEG072C	Investigate and report on electrical incidents	E
UEENEEG175A	Develop compliance policies and plans to conduct a electrical	UEENEEG075A	Develop compliance policies and plans to conduct a contracting	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	contracting business		business	
UEENEEG177A	Select low voltage power factor correction equipment		New Unit	
UEENEEG179A	Develop detailed electrical drawings		New Unit	
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems		New Unit	
UEENEEG181A	Provide advice on effective and energy efficient lighting products		New Unit	
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect		New Unit	
UEENEEG184A	Provide photometric data for illumination system design		New Unit	
UEENEEG185A	Select effective and efficient light sources and luminaires for given locations and designs		New Unit	
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings		New Unit	
UEENEEG187A	Design effective and efficient lighting for public, open and sports areas		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEG188A	Prepare quotations for the supply of effective and efficient lighting products for lighting projects		New Unit	
UEENEEG189A	Install and maintain emergency lighting systems		New Unit	
UEENEEG197A	Apply currency of safe working practices and compliance verification of electrical installations		New Unit	
UEENEEG198A	Apply compliance requirements to all aspects of electrical work		New Unit	
UEENEEG199A	Conduct compliance and functional verification of		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	electrical apparatus and existing circuits			
H – Electronics units				
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	UEENEEH001B	Carry out basic repairs to computer equipment by replacement of modules/sub-assemblies	E
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	UEENEEH002B	Carry out basic repairs to electronic apparatus by replacement of components	E
UEENEEH103A	Repair routine business equipment faults	UEENEEH003B	Carry out routine repairs to business equipment	E
UEENEEH104A	Set up and test residential video/audio equipment	UEENEEH004B	Set up and test residential audio/video equipment	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEH105A	Verify functionality and compliance of custom electronic installations	UEENEEH005B	Verify compliance and functionality of custom electronic installations	E
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises	UEENEEH006B	Assemble and set up fixed audio/video components and systems in buildings and premises	E
UEENEEH107A	Repair predictable faults in general electronic apparatus	UEENEEH007B	Carry out repairs of predictable faults in general electronic apparatus	E
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	UEENEEH008B	Assemble and erect reception antennae and signal distribution equipment	E
UEENEEH109A	Set up and test gaming and game equipment	UEENEEH009B	Set up and test gaming/games equipment	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEH110A	Install commercial video/audio system components	UEENEEH010B	Install commercial audio/video system components	E
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	UEENEEH011B	Troubleshoot d.c. power supplies with single phase input	E
UEENEEH112A	Troubleshoot digital sub-systems	UEENEEH012B	Troubleshoot digital subsystems	E
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	UEENEEH013B	Troubleshoot amplifiers	E
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	UEENEEH014B	Troubleshoot frequency dependent circuits	E
UEENEEH115A	Develop software solutions for microcontroller based systems	UEENEEH015B	Develop software solutions in microcontroller based systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus	UEENEEH016B	Find and repair faults in the microwave amplifier sections in electronic apparatus	E
UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus	UEENEEH017B	Carry out repairs of predictable faults in audio and video replay/recording apparatus	E
UEENEEH118A	Fault find and repair electronic apparatus	UEENEEH018B	Find and repair faults in electronic apparatus	E
UEENEEH119A	Repair predictable faults in television receivers	UEENEEH019B	Carry out repairs of predictable faults in television receivers	E
UEENEEH120A	Fault find and repair gaming and games equipment	UEENEEH020B	Find and repair faults in gaming and games equipment	E
UEENEEH121A	Fault find and repair high volume office	UEENEEH021B	Find and repair faults in high volume office	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	equipment		equipment	
UEENEEH12 2A	Fault find and repair remote control apparatus	UEENEEH02 2B	Find and repair faults in remote control apparatus	E
UEENEEH12 3A	Fault find and repair microwave heating apparatus	UEENEEH02 3B	Find and repair faults in microwave heating apparatus	E
UEENEEH12 4A	Repair predictable faults in audio components	UEENEEH02 4B	Carry out repairs of predictable faults in audio components	E
	Removed	UEENEEH02 5B	Provide solutions to single phase electronic power control problems	
	Removed	UEENEEH02 6B	Provide solutions to polyphase electronic power control problems	
UEENEEH12 7A	Set up and adjust commercial radio	UEENEEH02 7B	Commission commercial radio	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	frequency (RF) transmission and reception systems		frequency (RF) transmission and reception systems	
UEENEEH128A	Install and test microwave antennae and waveguides	UEENEEH028B	Install microwave and antennae and waveguides	E
UEENEEH129B	Fault find and repair navigation systems	UEENEEH029B	Diagnose and rectify faults in navigation systems	E
UEENEEH130A	Fault find and repair satellite-based surveillance and observation systems	UEENEEH030B	Diagnose and rectify faults in satellite-based surveillance and observation systems	E
UEENEEH131A	Fault find and repair radar apparatus and systems	UEENEEH031B	Diagnose and rectify faults in radar apparatus and systems	E
UEENEEH132A	Fault find and repair global positioning systems	UEENEEH032B	Diagnose and rectify faults in global positioning systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEH133A	Fault find and repair telecommunication apparatus and systems	UEENEEH033B	Diagnose and rectify faults in telecommunication apparatus and systems	E
UEENEEH134A	Fault find and repair electronic medical equipment	UEENEEH034B	Diagnose and rectify faults in electronic medical equipment	E
UEENEEH135A	Design custom electronic equipment installations	UEENEEH035B	Design custom electronic installations	E
UEENEEH136A	Design commercial video/audio installations	UEENEEH036B	Design commercial audio/video installations	E
UEENEEH137A	Program and commission commercial video/audio systems	UEENEEH037B	Program and commission commercial audio/video systems	E
UEENEEH138A	Fault find and repair complex power	UEENEEH038B	Find and repair faults in complex power	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	supplies		supplies	
UEENEEH139A	Troubleshoot basic amplifier circuits	UEENEEH039B	Troubleshoot basic amplifiers	E
UEENEEH140A	Fault find and repair sonar apparatus and systems	UEENEEH040B	Diagnose and rectify faults in sonar apparatus and systems	E
UEENEEH141A	Manage computer systems/electronics projects	UEENEEH041B	Manage electronics/computer systems projects	E
UEENEEH142A	Solve oscillator problems	UEENEEH042B	Troubleshoot oscillators	E
	Removed	UEENEEH043B	Diagnose and rectify faults in digital subsystems of electronic controls	
	Removed	UEENEEH044B	Diagnose and rectify faults in analogue circuits and components in	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			electronic control systems	
UEENEEH145A	Develop engineering solutions to analogue electronic problems	UEENEEH045B	Develop solutions to analogue electronic problems	E
UEENEEH146A	Solve fundamental electronic communications system problems	UEENEEH046B	Solve fundamental problems in electronic communications systems	E
UEENEEH147A	Assess electronic apparatus compliance	UEENEEH047B	Assess compliance of electronic apparatus	E
UEENEEH148A	Design and develop advanced digital systems	UEENEEH048B	Design and develop advanced digital systems	E
UEENEEH149A	Develop engineering solutions to audio electronic problems	UEENEEH049B	Develop solutions to audio electronic problems	E
UEENEEH150A	Assemble and set up basic security	UEENEEH050B	Assemble and set up basic wired and	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	systems		wireless security systems	
UEENEEH15 1A	Install large security systems	UEENEEH05 1B	Install large wired and wireless security systems	E
UEENEEH15 2A	Enter instructions and test wired and wireless security systems	UEENEEH05 2B	Enter instructions and test basic wired and wireless security systems	E
UEENEEH15 3A	Program and test large security systems	UEENEEH05 3B	Program and test large wired and wireless security systems	E
UEENEEH15 4A	Program and commission commercial security systems	UEENEEH05 4B	Program and commission commercial security alarm systems	E
UEENEEH15 5A	Program and commission commercial access control security	UEENEEH05 5B	Program and commission commercial security access control	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	systems		systems	
UEENEEH156A	Program and commission commercial security closed circuit television systems	UEENEEH056B	Program and commission commercial security closed circuit television (CCTV) systems	E
UEENEEH157A	Develop basic plans for integrating security systems	UEENEEH057B	Develop basic integrated security systems plan	E
UEENEEH158A	Design integrated security systems	UEENEEH058B	Design integrated security systems for a single site	E
UEENEEH159A	Design integrated complex security systems for multiple sites	UEENEEH059B	Design integrated complex security systems	E
UEENEEH160A	Plan large electronic projects	UEENEEH060B	Plan electronic projects	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEH161A	Install fire detection and warning system apparatus	UEENEEH061B	Position and terminate fire detection and warning system apparatus	E
UEENEEH162A	Verify compliance and functionality of fire protection system installations	UEENEEH062B	Verify compliance and functionality of fire protection installations	E
UEENEEH163A	Enter and verify programs for fire protection systems	UEENEEH063B	Enter and verify programs in preparation for commissioning fire protection systems	E
UEENEEH164A	Commission large fire protection systems	UEENEEH064B	Commission commercial fire protection systems	E
UEENEEH165A	Troubleshoot fire protection systems	UEENEEH065B	Find and repair faults in fire protection systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEH166A	Troubleshoot microcontroller based hardware systems	UEENEEH066B	Fault find Microcontroller based hardware	E
UEENEEH167A	Commission electronics and communications systems	UEENEEH067B	Commission electronics and communications systems	E
UEENEEH168A	Modify/redesign of electronics and communications systems	UEENEEH068B	Modify-redesign of electronics and communications system	E
UEENEEH169A	Solve problems in basic electronic circuits	UEENEEH069B	Solve problems in electronic circuits	E
	Removed	UEENEEH070B	Terminate and connect components, conductors, wiring and cables for electronic circuits	
UEENEEH17	Troubleshoot faults in	UEENEEH07	Find and repair faults	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
1A	television receivers	1B	in television receivers	
UEENEEH17 2A	Troubleshoot communication systems	UEENEEH07 2C	Find and repair faults in communication systems	E
UEENEEH17 3A	Troubleshoot professional audio reproduction components	UEENEEH07 3B	Find and repair faults in professional audio reproduction components	E
UEENEEH17 4A	Troubleshoot audio/video recording equipment	UEENEEH07 4B	Find and repair faults in audio/video recording equipment	E
UEENEEH17 5A	Troubleshooting in security system installations	UEENEEH07 5B	Find and rectify faults and malfunctions in security system installations	E
UEENEEH17 6A	Diagnose and rectify faults in electronic display circuits	UEENEEH07 6B	Diagnose and rectify faults in display circuits	E
UEENEEH17 7A	Diagnose and rectify faults in recording	UEENEEH07 7B	Diagnose and rectify faults in recording	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	and replay equipment		and replay apparatus	
UEENEEH178A	Diagnose and rectify faults in camera circuits and equipment	UEENEEH078B	Diagnose and rectify faults in camera circuits	E
UEENEEH179A	Diagnose and rectify faults in digital television circuits and apparatus	UEENEEH079B	Diagnose and rectify faults in digital television apparatus	E
UEENEEH180A	Diagnose and rectify faults in digital transmission circuits and systems	UEENEEH080B	Diagnose and rectify faults in digital transmission systems	E
UEENEEH181A	Design electronic printed circuit boards	UEENEEH081B	Design printed circuit boards	E
UEENEEH182A	Develop engineering solutions to RF amplifiers problems	UEENEEH082B	Develop solutions to RF amplifiers problems	E
UEENEEH183A	Analyse the performance of	UEENEEH083B	Analyse the performance of	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	wireless-based electronic/communication systems		wireless-based electronic systems	
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	UEENEEH084B	Modify DSP based sub-systems	E
UEENEEH185A	Design signal-conditioning subsystems	UEENEEH085B	Design a signal-conditioning subsystem	E
UEENEEH186A	Commission satellite and microwave communication systems	UEENEEH086B	Commission microwave and satellite communication systems	E
UEENEEH187A	Solve problems in electronic musical equipment circuits	UEENEEH087B	Solve problems in musical equipment circuits	E
UEENEEH188A	Design and develop electronics/ computer systems projects	UEENEEH088B	Design and develop electronics/computer systems project	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEH190A	Provide engineering solutions to air traffic control system problems	UEENEEH090A	Provide solutions to air traffic control system problems	E
UEENEEH191A	Diagnose and rectify faults in air navigation circuits and systems	UEENEEH091A	Diagnose and rectify faults in air navigation systems	E
UEENEEH192A	Develop solutions for air surveillance apparatus and systems	UEENEEH092A	Develop engineering solutions for air surveillance apparatus and systems	E
UEENEEH189A	Provide Gate Array solutions for complex electronics systems		New Unit	
I – Instrumentation and control units				
	Removed	UEENEEI001B	Install and set up transducers and sensing devices	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEI102A	Solve problems in pressure measurement components and systems	UEENEEI002B	Solve problems in pressure measurement systems	E
UEENEEI103A	Solve problems in density/level measurement components and systems	UEENEEI003B	Solve problems in density/level measurement systems	E
UEENEEI104A	Solve problems in flow measurement components and systems	UEENEEI004B	Solve problems in flow measurement systems	E
UEENEEI105A	Solve problems in temperature measurement components and systems	UEENEEI005B	Solve problems in temperature measurement systems	E
UEENEEI106A	Set up and adjust PID control loops	UEENEEI006B	Solve problems in process controllers,	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			transmitters and converters	
UEENEEI107A	Install instrumentation and control cabling and tubing	UEENEEI007C	Install process instrumentation and control cabling and tubing	E
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	UEENEEI008C	Install process control apparatus and associated equipment	E
UEENEEI118A and UEENEEI131A UEENEEI132A UEENEEI133A	Set up weighting measuring and control instruments Set up gas analysis measuring and control instruments Set up water analysis measuring and control instruments Set up scientific analysis measuring and control	UEENEEI009B	Set up process measuring and control instruments	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	instruments			
UEENEEI110 A	Set up and adjust advanced PID process control loops	UEENEEI010 B	Set up and adjust process control loops	E
UEENEEI111 A	Find and rectify faults in process final control elements	UEENEEI011 B	Find and rectify faults in process control valve and associated equipment	E
UEENEEI112 A	Verify compliance and functionality of instrumentation and control installations	UEENEEI012 B	Verify compliance and functionality of process control installations	E
UEENEEI113 A	Setup and configure Human-Machine Interface (HMI) and	UEENEEI013 B	Select equipment for process control	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	industrial networks		systems	
UEENEEI114 A	Trouble shoot process control systems	UEENEEI014 B	Find and rectify faults in process control systems	E
UEENEEI115 A	Trouble shooting in medical equipment control systems	UEENEEI015 B	Find and rectify faults in medical equipment control systems	E
UEENEEI117 A	Calibrate, adjust and test measuring instruments	UEENEEI017 B	Calibrate and test measuring instruments	E
UEENEEI119 A	Set up industrial field control devices	UEENEEI019 B	Set up field control devices	E
UEENEEI120 A	Provide solutions to problems in industrial control systems	UEENEEI020 B	Provide solutions to problems in basic industrial control systems	E
UEENEEI121 A	Trouble shoot in measuring and analysis systems	UEENEEI021 B	Find and repair faults in measuring and analysis systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEI122A	Assist in commissioning process and instrumentation control systems	UEENEEI022B	Assist in commissioning process control systems	E
UEENEEI123A	Design electronic control systems	UEENEEI023B	Design electronic control systems	E
UEENEEI125A	Provide solutions to fluid circuit operations	UEENEEI025B	Provide solutions to fluid circuit operations	E
UEENEEI126A	Provide solutions to pneumatic/ hydraulic system operations	UEENEEI026B	Provide solutions to pneumatic/hydraulic system operations	E
UEENEEI127A	Analyse complex electronic circuits controlling fluids	UEENEEI027B	Analyse complex electronic circuits controlling fluids	E
UEENEEI128A	Set up and configure controls on complex fluid systems	UEENEEI028B	Set up controls on complex fluid systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEI129A	Set up electronically controlled mechanically operated complex systems	UEENEEI029B	Set up electronically controlled mechanically operated complex systems	E
UEENEEI130A	Set up electronically controlled robotically operated complex systems	UEENEEI030B	Set up electronically controlled robotically operated complex systems	E
UEENEEI131A UEENEEI132A UEENEEI133A and UEENEEI118A	Set up gas analysis measuring and control instruments Set up water analysis measuring and control instruments Set up scientific analysis measuring and control instruments Set up weighting measuring and control instruments	UEENEEI009B	Set up process measuring and control instruments	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEI134A	Manage instrumentation and control projects	UEENEEI034B	Manage control projects	E
UEENEEI135A	Plan instrumentation and control projects	UEENEEI035B	Plan control projects	E
UEENEEI136A	Manage automated control systems projects	UEENEEI036B	Manage automated systems projects	E
UEENEEI137A	Plan automated and control systems projects	UEENEEI037B	Plan automated systems projects	E
UEENEEI138A	Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	UEENEEI038A	Provide solutions to ELV electro-pneumatic control systems and drives	E
UEENEEI140A	Plan the electrical installation of integrated systems	UEENEEI040A	Plan the installation of integrated systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEI141 A	Develop electrical integrated systems	UEENEEI041 A	Develop integrated systems	E
UEENEEI142 A	Develop an electrical integrated system interface for access through a touch screen	UEENEEI042 A	Develop an integrated system interface for access through a touch screen	E
UEENEEI143 A	Develop access control of electrical integrated systems using logic-based programming tools	UEENEEI043 A	Develop access control of integrated systems using logic-based programming tools	E
UEENEEI144 A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	UEENEEI044 A	Develop interfaces for multiple access methods to monitor, schedule and control an integrated system	E
UEENEEI101 A	Use instrumentation drawings, specification,		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	standards and equipment manuals			
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices		New Unit	
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems		New Unit	
UEENEEI139A	Diagnose and rectify faults in digital controls systems		New Unit	
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems		New Unit	
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEI147A	Diagnose and rectify faults in servo drive systems		New Unit	
UEENEEI148A	Solve problems in single phase electronic power control circuits		New Unit	
UEENEEI149A	Solve problems in polyphase electronic power control circuits		New Unit	
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers		New Unit	
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems		New Unit	
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks		New Unit	
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Iinterfacing		New Unit	
UEENEEI155A	Develop structured programs to control external devices		New Unit	
UEENEEI156A	Develop and test code for microcontroller devices		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEI157A	Configure and maintain industrial control system networks		New Unit	
J – Refrigeration and Air Conditioning units				
	Removed	UEENEEJ002B	Prepare refrigerant tubing and fittings	
	Removed	UEENEEJ003B	Determine the basic operating conditions of vapour compression systems	
	Removed	UEENEEJ004B	Determine the basic operating conditions of air conditioning systems	
	Removed	UEENEEJ005B	Position, assemble and start up split air conditioning systems	
	Removed	UEENEEJ006	Install pipework for refrigeration and air	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
		B	conditioning systems	
	Removed	UEENEEJ007 B	Install refrigeration and air conditioning systems, major components and associated equipment	
	Removed	UEENEEJ008 B	Recover, pressure and leak test, evacuate and charge refrigerants	
	Removed	UEENEEJ009 B	Verify compliance and functionality of refrigeration and air conditioning installations	
	Removed	UEENEEJ010 B	Select refrigerant pipe/tube, accessories and associated controls	
	Removed	UEENEEJ011 B	Diagnose and rectify faults in refrigeration	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			and air conditioning systems and components	
	Removed	UEENEEJ013B	Commission refrigeration and air conditioning systems	
	Removed	UEENEEJ015B	Solve problems in beverage dispensers	
	Removed	UEENEEJ018B	Solve problems in post mix refrigeration systems	
	Removed	UEENEEJ019B	Solve problems in ice making systems	
	Removed	UEENEEJ020B	Solve problems in industrial refrigeration systems	
	Removed	UEENEEJ021B	Monitor and adjust energy management systems on refrigeration systems	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	Removed	UEENEEJ053 B	Find and rectify faults in appliance motors and associated controls	
	Removed	UEENEEJ067 B	Solve problems in central plant air conditioning systems	
	Removed	UEENEEJ070 B	Diagnose and rectify faults in refrigeration and air conditioning control systems	
	Removed	UEENEEJ072 B	Recover, pressure and leak test, evacuate and charge refrigerants – split air conditioning systems	
UEENEEJ120 A	Resolve problems in industrial refrigeration systems		New Unit	
K – Renewable/Sustainable Energy				

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems	UEENEEK001B	Maintain safety and tidiness of remote area power supply (RAPS) systems	E
UEENEEK102A	Work safely with remote area power supply systems	UEENEEK002B	Work safely with remote area power supply (RAPS) systems	E
UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks	UEENEEK003B	Conduct periodic maintenance of remote area power supply (RAPS) battery banks	E
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets	UEENEEK004B	Conduct periodic maintenance of remote area power supply (RAPS) generator sets	E
UEENEEK105A	Conduct periodic maintenance of remote area power	UEENEEK005B	Conduct periodic maintenance of remote area power	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	supply photo voltaic arrays		supply (RAPS) photo voltaic arrays	
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators	UEENEEK006B	Conduct periodic maintenance of remote area power supply (RAPS) wind generators	E
UEENEEK107A	Conduct checks in the demand side use of remote area power supplies (RAPS)	UEENEEK007B	Conduct checks in the demand side use of remote area power supplies	E
UEENEEK108A	Plan periodic maintenance schedules of remote area power supplies (RAPS)	UEENEEK008B	Plan periodic maintenance schedules of remote area power supplies	E
UEENEEK109A	Attend to breakdowns in remote area power supplies (RAPS)	UEENEEK009B	Attend to breakdowns in remote area power supplies	E
UEENEEK110A	Co-ordinate maintenance of	UEENEEK010B	Coordinate maintenance of	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	renewable energy (RE) apparatus and systems		renewable energy apparatus and systems	
UEENEEK111A	Assemble and connect remote area power supplies	UEENEEK011B	Assemble and connect remote area power supplies (RAPS)	E
UEENEEK112A	Provide basic sustainable energy solutions for energy reduction in residential premises	UEENEEK012B	Provide basic sustainable energy solutions for energy reduction in domestic premises	E
	Removed	UEENEEK013B	Apply sustainable energy practice in daily activities	
UEENEEK114A	Promote sustainable energy practices in the community	UEENEEK014B	Promote sustainable energy practice in the community	E
UEENEEK116A	Maintain and repair remote area power generation facilities	UEENEEK016A	Maintain and repair remote area power generation facilities	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEK117A	Maintain and repair facilities associated with remote area essential service operations	UEENEEK017B	Maintain and repair facilities associated with remote area essential services operation	E
UEENEEK120A	Maintain operation of remote area power generation plant	UEENEEK020B	Maintain operation of remote area power plant	E
UEENEEK121A	Manage renewable energy (RE) projects	UEENEEK021B	Manage renewable energy projects	E
UEENEEK122A	Plan renewable energy (RE) projects	UEENEEK022B	Plan renewable energy projects	E
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	UEENEEK023B	Carry out basic repairs to renewable energy apparatus by replacement of components	E
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and	UEENEEK025C	Solve basic problems in photovoltaic energy apparatus	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	systems			
	Removed	UEENEEK026B	Install and set up grid connected photovoltaic power systems	
UEENEEK127A	Diagnose and rectify faults in renewable energy control systems	UEENEEK027B	Diagnose faults in renewable energy control systems	E
UEENEEK128A	Solve problems in stand-alone renewable energy systems	UEENEEK028B	Solve problems in stand-alone renewable energy systems	E
UEENEEK129A	Design renewable energy (RE) heating systems	UEENEEK029B	Design renewable energy heating systems	E
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW	UEENEEK030B	Solve problems in wind energy conversion systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEK131A	Design wind energy conversion systems (WECS) rated to 10 kW	UEENEEK031B	Design wind energy conversion systems rated to 10 kW	E
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	UEENEEK032B	Develop strategies to address sustainability issues	E
UEENEEK133A	Design hybrid renewable power systems	UEENEEK033B	Design set up hybrid power systems	E
UEENEEK134A	Install ELV stand-alone photovoltaic power systems	UEENEEK034B	Install standalone photovoltaic power systems	E
UEENEEK135A	Design grid connected photovoltaic power supply systems	UEENEEK035C	Design grid connected power supply systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEK136A	Install, configure and commission LV micro-hydro systems rated up to 6.4 kW	UEENEEK036B	Prepare grid connected photovoltaic power systems for LV connection	E
UEENEEK137A	Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	UEENEEK037B	Install and set up micro-hydro systems	E
UEENEEK138A	Design micro-hydro systems rated to 6.4 kW	UEENEEK038B	Design micro-hydro systems	E
UEENEEK139A	Design stand-alone renewable energy (RE) systems	UEENEEK039B	Design stand-alone renewable energy systems	E
UEENEEK140A	Develop engineering solutions to renewable energy (RE) problems	UEENEEK040B	Develop engineering solution to renewable energy problems	E
UEENEEK14	Apply environmentally and	UEENEEK04	Participate in environmentally	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
2A	sustainable energy procedures in the energy sector	2A	sustainable work practices	
UEENEEK143A	Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	UEENEEK043A	Install small wind energy conversion systems for stand-alone applications	E
UEENEEK145A	Implement and monitor energy sector environmental and sustainable energy policies and procedures	UEENEEK045A	Implement & monitor, policies & procedures for environmentally sustainable electrotech work practice	E
UEENEEK146A	Design energy management controls for electrical installations in buildings	UEENEEK046A	Design energy management controls for electrical installations in buildings	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	Removed	UEENEEK047A	Maintain and monitor remote area essential service operations	
UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	UEENEEK048A	Install, configure and commission grid connected photovoltaic power systems	E
UEENEEK149A	Verify compliance and functionality of a extra low voltage renewable energy installation	UEENEEK049A	Verify compliance and functionality of a renewable energy installation	E
	Removed	UEENEEK050A	Assemble and set up photovoltaic apparatus in a domestic dwelling	
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	UEENEEK051A	Develop effective strategies for energy reduction in buildings	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEK118A	Maintain and monitor remote area essential service (RAPS) operations		New Unit	
UEENEEK124A	Solve basic problems in micro hydro systems		New Unit	
UEENEEK144A	Install, configure and commission LV wind energy conversion systems rated up to 10 kW		New Unit	
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations		New Unit	
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises		New Unit	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities		New Unit	
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises		New Unit	
N – Rail signalling units				
UEENEEN101A	Maintain mechanical rail signalling equipment and infrastructure	UEENEEN001B	Service mechanical signalling equipment and infrastructure	E
UEENEEN102A	Assemble and wire internal electrical rail signalling equipment	UEENEEN002B	Assemble and wire internal electrical signalling equipment	E
UEENEEN103A	Install and maintain rail track circuit leads and bonds	UEENEEN003B	Install and maintain track circuit leads and bonds	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEN104A	Test copper rail signalling cables	UEENEEN004B	Perform cable tests	E
UEENEEN105A	Install and maintain rail signalling power supplies	UEENEEN005B	Install and maintain signalling power supplies	E
UEENEEN106A	Install and maintain non-vital screen based control systems	UEENEEN006B	Maintain remote control and non-vital interlocking control systems	E
UEENEEN107A	Install and maintain active level crossing equipment	UEENEEN007B	Maintain power signalling and protected level crossing equipment	E
UEENEEN108A	Install and maintain power operated point actuating devices	UEENEEN008B	Maintain on-site power operated point-activating devices	E
UEENEEN109A	Install and maintain train detection equipment	UEENEEN009B	Maintain track circuit equipment	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEN110A	Install and maintain non-vital telemetry systems	UEENEEN010B	Maintain electronic signalling and communication equipment	E
UEENEEN111A	Install and maintain trackside signal and train protection equipment	UEENEEN011B	Install and maintain power operated signalling equipment	E
UEENEEN112A	Install and maintain vital relay interlocking systems	UEENEEN012B	Maintain power signalling and protective relay interlocking systems	E
	Removed	UEENEEN013B	Install and test computer based interlocking equipment	
UEENEEN114A	Install and maintain computer based interlocking rail systems	UEENEEN014B	Maintain computer based and solid state interlocking systems	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	Removed	UEENEEN015B	Conduct routine inspecting and testing of new signal cables and lines	
UEENEEN116A	Maintain electronic and microprocessor-based remote control systems	UEENEEN016B	Maintain electronic switched and microprocessor-based remote control systems	E
	Removed	UEENEEN017B	Install and maintain transmission interface equipment	
UEENEEN118A	Find and repair rail signalling system faults	UEENEEN018B	Find and repair wiring system faults	E
	Removed	UEENEEN019B	Test equipment and isolate faults	
	Removed	UEENEEN020B	Install electrical power and control equipment for rail	

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			networks	
UEENEEN121A	Repair rail signalling power and control cables	UEENEEN021A	Repair rail signalling cables	E
	Removed	UEENEEN025B	Coordinate and manage track protection	
UEENEEN126A	Develop rail signalling system maintenance programs	UEENEEN026B	Develop rail signalling maintenance programs	E
UEENEEN127A	Decommission electrical and electro-mechanical rail signalling from service	UEENEEN027B	Decommission electrical and electro-mechanical signalling from service	E
UEENEEN128A	Test and commission rail power equipment	UEENEEN028B	Test and commission power signalling equipment	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
P – Restricted and specialist electrical work units				
UEENEEP010A	Disconnect / reconnect appliances connected to low voltage installation wiring	UEENEEP001B	Disconnect and reconnect fixed wired electrical equipment connected to a Low Voltage supply (Endorsement for Appliances)	E
UEENEEP011A	Disconnect / reconnect neon signs connected to low voltage installation wiring	UEENEEP001B	Disconnect and reconnect fixed wired electrical equipment connected to a Low Voltage supply (Endorsement for Neon Signs)	E
UEENEEP013A	Disconnect / reconnect control devices connected to low voltage installation wiring	UEENEEP001B	Disconnect and reconnect fixed wired electrical equipment connected to a Low Voltage supply (Endorsement for Control Devices)	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEP014A	Disconnect / reconnect water heaters connected to low voltage installation wiring	UEENEEP001B	Disconnect and reconnect fixed wired electrical equipment connected to a Low Voltage supply (Endorsement for Water Heaters)	E
UEENEEP015A	Disconnect / reconnect motors connected to low voltage installation wiring	UEENEEP001B	Disconnect and reconnect fixed wired electrical equipment connected to a Low Voltage supply (Endorsement for Motors)	E
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	UEENEEP002B	Attach cords and plugs to electrical equipment for connection to a single phase 250 Volt supply	E
UEENEEP025A	Attach cords, cables and plugs to electrical	UEENEEP003B	Attach cords and plugs to electrical	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
	equipment for connection to 1000 V a.c. or 1500 V d.c. supply		equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	
UEENEEP021 A	Disconnect / reconnect explosion-protected appliances and control devices connected to low voltage installation wiring	UEENEEP004 B	Disconnect and reconnect explosion-protected electrical equipment connected to Low Voltage supply	E
UEENEEP022 A	Disconnect and reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles	UEENEEP005 B	Disconnect and reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles	E
UEENEEP023 A	Attach flexible cables and plugs to electrical equipment connected to a HV supply	UEENEEP006 B	Attach flexible cables and plugs to electrical equipment connected to a high voltage	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
			supply	
UEENEEP016 A	Locate and rectify faults in low voltage appliances using set procedures	UEENEEP007 B	Locate and rectify faults in electrical low voltage equipment following prescribed procedures (Endorsement for Appliances)	E
UEENEEP018 A	Locate and rectify faults in low voltage control devices using set procedures	UEENEEP007 B	Locate and rectify faults in electrical low voltage equipment following prescribed procedures (Endorsement for Control Devices)	E
UEENEEP019 A	Locate and rectify faults in low voltage water heaters using set procedures	UEENEEP007 B	Locate and rectify faults in electrical low voltage equipment following prescribed procedures (Endorsement for Water Heaters)	E

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Code in UEE11 V1	Qualification Title in UEE11 V1	Code in UEE07 V4	Qualification Title in UEE07 V4	E = Equivalent N= Not Equivalent
UEENEEP020A	Locate and rectify faults in low voltage motors using set procedures	UEENEEP007B	Locate and rectify faults in electrical low voltage equipment following prescribed procedures (Endorsement for Motors)	E
UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	UEENEEP008B	Conduct in-service safety testing of electrical cord assemblies and cord connected equipment	E

Rationalised Units

Table 2 The units from UEE07 Version 4 listed below have been replaced by imported units from the UET11 ESI –Transmission Distribution and Rail Training Package.

Imported Unit Code	Imported Unit Title	UEE07 V4 Code	UEE07 V4 Unit Title	Equivalent Not Equivalent
UETTDRIS74A	Develop engineering solutions for energy supply system protection problems	UEENEEG046B	Develop engineering solutions for energy supply system protection problems	E

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UETTDRIS73A	Develop engineering solutions for energy supply power transformer problems	UEENEEG040B	Develop engineering solutions for energy supply power transformer problems	E
UETTDRIS72A	Diagnose and rectify faults in distributed Generation systems	UEENEEG039B	Diagnose and rectify faults in distributed generation systems	E
UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission systems	UEENEEG042B	Diagnose and rectify faults in electrical energy supply transmission systems	E
UETTDRIS70A	Diagnose and rectify faults in electrical energy distribution systems	UEENEEG038B	Diagnose and rectify faults in electrical energy distribution systems	E
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus	UEENEEG037B	Diagnose and rectify faults in energy supply apparatus	E
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	UEENEEG015B	Find and rectify faults in energy supply network equipment	E
UETTDRIS67A	Solve problems in energy supply network equipment	UEENEEG015B	Find and rectify faults in energy supply network equipment	E
UETTDRIS44A	Perform HV field switching operation to a given schedule	UEENEEG034B	Perform high voltage field switching to a given schedule	E

Table 2 – Relationship of UEE07 Electrotechnology Training Package CSUs Version 4 to UEE07 Electrotechnology Training Package CSUs Version 3.1

NOTE: This table has been updated in UEE11 V1.3 to amend errors in the mapping table below.

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
UEENEEE011C	Manage risk in electrotechnology activities	UEENEE011B	Manage risk in electrotechnology activities	E
UEENEEE080A	Apply industry and community standards to engineering activities		New Unit	
UEENEEE081A	Apply material science to solving electrotechnology engineering problems		New Unit	
UEENEEE082A	Apply physics to solving electrotechnology engineering problems		New Unit	
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline		New Unit	
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	UEENEEE001B	Apply OHS practices in the workplace	E
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	UEENEEE002B	Dismantle, assemble and fabricate electrotechnology components	E
UEENEEE104A	Solve problems in d.c. circuits	UEENEEE004B	Solve problems in multiple path d.c. circuits	E

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
UEENEEE105A	Fix and secure electrotechnology equipment	UEENEEE005B	Fix and secure equipment	E
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	UEENEEE007B	Use drawings, diagrams, schedules and manuals	E
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	UEENEEE025B	Solve problems in complex multiple path circuits	E
UEENEEE126A	Provide solutions to basic engineering computational problems	UEENEEE026B	Provide computational solutions to basic engineering problems	E
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	UEENEEE037B	Document occupational hazards and risks in electrotechnology	E
UEENEEG006A	Solve problems in single and three phase low voltage machines		New Unit	
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits		New Unit	
UEENEEG063A	Arrange circuits, control and protection for general electrical installations		New Unit	
UEENEEG076A	Install and replace low voltage current		New Unit	

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
	transformer metering			
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	UEENEEG001B	Solve problems in electromagnetic circuits	E
UEENEEG102A	Solve problems in low voltage a.c. circuits	UEENEEG002B	Solve problems in single and three phase low voltage circuits	E
UEENEEG103A	Install low voltage wiring and accessories	UEENEEG003B	Install wiring and accessories for low voltage circuits	E
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	UEENEEG004B	Install low voltage electrical apparatus and associated equipment	E
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	UEENEEG005B	Verify compliance and functionality of general electrical installations	E
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits		New Unit	
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	UEENEEG007B	Select and arrange equipment for general electrical installations	E
UEENEEG108A	Trouble-shoot and repair faults in low voltage	UEENEEG008B	Find and repair faults in electrical	E

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
	electrical apparatus and circuits		apparatus and circuits	
UEENEEG109A	Develop and connect electrical control circuits	UEENEEG009B	Develop and connect control circuits	E
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	UEENEEG049B	Solve problems in complex polyphase power circuits	E
UEENEEG171A	Install, set up and commission interval metering	UEENEEG071C	Install and set up interval metering	E
UEENEEH091A	Diagnose and rectify faults in air navigation systems		New Unit	
UEENEEH092A	Develop engineering solutions for air surveillance apparatus and systems		New Unit	
UEENEEI038A	Provide solutions to ELV electro-pneumatic control systems and drives		New Unit	
UEENEEI040A	Plan the installation of integrated systems		New Unit	
UEENEEI041A	Develop integrated systems		New Unit	
UEENEEI042A	Develop an integrated system interface for		New Unit	

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UEE07 Unit Code – V4	UEE07 Unit Title – V4	UEE07 Unit Code – V3.1	UEE07 Unit Title – V3.1	E = Equivalent N = Not Equivalent -
	access through a touch screen			
UEENEEI043A	Develop access control of integrated systems using logic-based programming tools		New Unit	
UEENEEI044A	Develop interfaces for multiple access methods to monitor, schedule and control an integrated system		New Unit	
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	UEENEEJ002B	Prepare refrigerant tubing and fittings	E
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	UEENEEJ003B	Determine the basic operating conditions of vapour compression systems	E
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	UEENEEJ004B	Determine the basic operating conditions of air conditioning systems	E
UEENEEJ105A	Position, assemble and start up single head split air conditioning and water heating heat pump systems	UEENEEJ005B	Position, assemble and start up split air conditioning systems	E
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	UEENEEJ006B	Install pipework for refrigeration and air conditioning systems	E

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment	UEENEEJ007B	Install refrigeration and air conditioning systems, major components and associated equipment	E
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	UEENEEJ008B	Recover, pressure and leak test, evacuate and charge refrigerants	E
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations	UEENEEJ009B	Verify compliance and functionality of refrigeration and air conditioning installations	E
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	UEENEEJ010B	Select refrigerant pipe/tube, accessories and associated controls	E
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components	UEENEEJ011B	Diagnose and rectify faults in refrigeration and air conditioning systems and components	E
UEENEEJ112A	Diagnose and rectify faults in complex air conditioning/refrigeration systems	UEENEEJ012B	Diagnose and rectify faults in complex refrigeration/air conditioning systems	E
UEENEEJ113A	Commission air conditioning and refrigeration systems	UEENEEJ013B	Commission refrigeration and air conditioning systems	E
UEENEEJ114A	Resolve problems in hydronic systems	UEENEEJ014B	Solve problems in hydronic systems	E

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
UEENEEJ115A	Resolve problems in beverage dispensers	UEENEEJ015B	New Unit	
UEENEEJ116A	Resolve problems in transport refrigeration systems	UEENEEJ016B	Solve problems in transport refrigeration systems	E
UEENEEJ117A	Resolve problems in ultra-low temperature refrigeration systems	UEENEEJ017B	Solve problems in ultra-low temperature refrigeration systems	E
UEENEEJ118A	Resolve problems in post mix refrigeration systems	UEENEEJ018B	Solve problems in post mix refrigeration systems	E
UEENEEJ119A	Resolve problems in ice making systems	UEENEEJ019B	Solve problems in ice making systems	E
UEENEEJ121A	Monitor and adjust refrigeration energy management systems	UEENEEJ021B	Monitor and adjust energy management systems on refrigeration systems	E
UEENEEJ122A	Diagnose faults in complex HVAC /refrigeration control systems	UEENEEJ022B	Diagnose faults in complex refrigeration or HVAC control systems	E
UEENEEJ123A	Commission complex (HVAC) heating, ventilation and air conditioning systems	UEENEEJ023B	Commission complex heating, ventilation and air conditioning (HVAC) systems	E
UEENEEJ124A	Commission refrigeration/air conditioning hydronic systems	UEENEEJ024B	Commission hydronic systems for refrigeration and/or air conditioning	E

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UEE07 Unit Code – V4	UEE07 Unit Title – V4	UEE07 Unit Code – V3.1	UEE07 Unit Title – V3.1	E = Equivalent N = Not Equivalent -
UEENEEJ125A	Commission complex refrigeration systems and equipment	UEENEEJ025B	Commission complex refrigeration systems	E
UEENEEJ126A	Commission complex refrigeration/air conditioning control systems	UEENEEJ026B	Commission complex control systems for refrigeration/air conditioning	E
UEENEEJ127A	Establish the thermodynamic parameters of refrigeration and air conditioning systems	UEENEEJ027B	Determine thermodynamic parameters of refrigeration and air conditioning systems	E
UEENEEJ128A	Produce HVAC/R system design drawings	UEENEEJ028B	Produce HVAC/R design drawings	E
UEENEEJ129A	Establish heat loads for commercial refrigeration and air conditioning applications	UEENEEJ029B	Determine the heat loads for commercial refrigeration and air conditioning applications	E
UEENEEJ130A	Produce HVAC/R control system diagrams	UEENEEJ030B	Produce HVAC/R control system design diagrams	E
UEENEEJ131A	Determine noise and vibration encountered in HVAC/R applications	UEENEEJ031B	Provide solutions to vibration problems in HVAC/R system design	E
UEENEEJ132A	Design commercial refrigeration systems and select components	UEENEEJ032B	Design commercial refrigeration systems	E

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UEE07 Unit Code – V4	UEE07 Unit Title – V4	UEE07 Unit Code – V3.1	UEE07 Unit Title – V3.1	E = Equivalent N = Not Equivalent -
UEENEEJ133A	Design industrial refrigeration systems and select components	UEENEEJ033B	Design industrial refrigeration systems	E
UEENEEJ134A	Design heating, ventilation and air conditioning (HVAC) systems and select components	UEENEEJ034B	Design heating, ventilation and air conditioning (HVAC) systems	E
UEENEEJ135A	Design control systems for refrigeration or heating, ventilation and air conditioning systems	UEENEEJ035B	Design control systems for a heating, ventilation, air conditioning or refrigeration system	E
UEENEEJ136A	Evaluate and report on building services energy management systems	UEENEEJ036B	Evaluate and report on energy management	E
UEENEEJ137A	Evaluate and report on the indoor air quality of buildings	UEENEEJ037B	Evaluate and report on air quality in buildings	E
UEENEEJ138A	Analyse vibration and noise in refrigeration and air conditioning systems	UEENEEJ038B	Analyse noise and vibration in refrigeration and air conditioning systems	E
UEENEEJ139A	Develop specifications and prepare drawings for HVAC/Refrigeration projects	UEENEEJ039B	Develop specifications and prepare drawings for HVAC/R projects	E
UEENEEJ141A	Design complex commercial refrigeration	UEENEEJ041B	Design complex commercial	E

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UEE07 Unit Code – V4	UEE07 Unit Title – V4	UEE07 Unit Code – V3.1	UEE07 Unit Title – V3.1	E = Equivalent N = Not Equivalent -
	systems and select equipment		refrigeration systems	
UEENEEJ142A	Design complex industrial refrigeration systems and select equipment	UEENEEJ042B	Design complex industrial refrigeration systems	E
UEENEEJ143A	Design complex air conditioning systems and select equipment	UEENEEJ043B	Design complex air conditioning systems	E
UEENEEJ144A	Design mechanical ventilation/exhaust systems and select equipment	UEENEEJ044B	Design mechanical ventilation/exhaust systems	E
UEENEEJ145A	Design hydronic systems and select equipment	UEENEEJ045B	Design hydronic systems	E
UEENEEJ146A	Design complex control systems for refrigeration, heating ventilation or air conditioning systems	UEENEEJ046B	Design complex control systems for heating, ventilation, air conditioning or refrigeration systems	E
UEENEEJ147A	Audit energy use for commercial HVAC/Refrigeration systems	UEENEEJ047B	Audit energy use for commercial HVAC/R systems	E
UEENEEJ148A	Audit HVAC/R control systems for compliance with regulations and standards	UEENEEJ048B	Audit HVAC/R control systems for compliance with standards and regulations	E

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
UEENEEJ149A	Develop heat exchanger design specifications	UEENEEJ049B	Develop specifications for heat exchanger designs	E
UEENEEJ150A	Evaluate new and alternative technologies applicable to electrotechnology applications	UEENEEJ050B	Evaluate alternative and new technologies applicable to electrotechnology applications	E
UEENEEJ151A	Service small electrical appliances and power tools	UEENEEJ051B	Service small appliances and power tools	E
	Deleted	UEENEEJ052B	Carry out repairs to appliance refrigeration systems	

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	UEENEEJ053B	Find and rectify faults in appliance motors and associated controls	N
UEENEEJ154A	Find and rectify faults in appliance control systems and devices	UEENEEJ054B	Find and rectify faults in appliance control devices and systems	E
UEENEEJ155A	Service refrigeration appliances	UEENEEJ055B	Service refrigerated appliances	E
UEENEEJ156A	Service clothes washing machines and dryers	UEENEEJ056B	Service clothes washers and dryers	E
UEENEEJ157A	Service electrical heating appliances	UEENEEJ057B	Service electric heating appliances	E
UEENEEJ158A	Service dishwasher machines	UEENEEJ058B	Service dish washing machines	E
UEENEEJ159A	Service gas heating appliances	UEENEEJ059B	Service gas appliances	E
UEENEEJ161A	Verify functionality and compliance of appliances	UEENEEJ061B	Verify compliance and functionality of appliances	E
UEENEEJ162A	Recover, pressure test, evacuate, charge and leak test refrigerants — appliances	UEENEEJ062B	Recover, pressure and leak test, evacuate and charge refrigerants – appliances	E
	Deleted	UEENEEJ063B	Analyse the psychrometric and thermodynamic performance of	

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
			HVAC/R systems	
UEENEEJ164A	Analyse the operation of HVAC air and hydronic systems	UEENEEJ064B	Analyse the operation of HVAC/R systems	E
UEENEEJ165A	Evaluate thermodynamic and fluid parameters of refrigeration systems	UEENEEJ065B	Evaluate fluid and thermodynamic parameters of refrigeration systems	E
UEENEEJ166A	Resolve problems in dairy refrigeration systems	UEENEEJ066B	Solve problems in dairy refrigeration systems	E
UEENEEJ167A	Resolve problems in central plant air conditioning systems	UEENEEJ067B	Solve problems in central plant air conditioning systems	E
UEENEEJ168A	Maintain microbial control of refrigeration and air conditioning systems	UEENEEJ068B	Maintain microbial control of air and water systems	E
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	UEENEEJ070B	Diagnose and rectify faults in refrigeration and air conditioning control systems	E
UEENEEJ171A	Resolve problems in refrigerated beverage vending cabinets	UEENEEJ071B	Solve problems in refrigerated beverage vending cabinets	E
UEENEEJ172A	Recover, pressure test, evacuate, charge and	UEENEEJ072B	Recover, pressure and leak test, evacuate and charge refrigerants – split air	E

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UEE07 Unit Code – V4	UEE07 Unit Title – V4	UEE07 Unit Code – V3.1	UEE07 Unit Title – V3.1	E = Equivalent N = Not Equivalent -
	leak test refrigerants — split systems		conditioning systems	
UEENEEJ173A	Service and repair microwave ovens	UEENEEJ073B	Service microwave ovens	E
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	UEENEEJ074A	Safety awareness and legal requirements for hydrocarbon refrigerants	E
UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	UEENEEJ075A	Service and repair self contained hydrocarbon refrigeration and air conditioning systems	E
UEENEEJ176A	Install and commission hydrocarbon refrigeration systems, components and associated equipment	UEENEEJ076B	Install and commission hydrocarbon refrigeration systems, major components and associated equipment	E
UEENEEJ177A	Design hydrocarbon refrigerated systems	UEENEEJ077A	Design hydrocarbon refrigeration systems	E
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant	UEENEEJ078A	Safety awareness in using ammonia as a refrigerant	E
UEENEEJ179A	Repair and service ammonia refrigeration systems	UEENEEJ079A	Service and repair ammonia refrigeration systems	E
UEENEEJ180A	Install and commission ammonia refrigeration systems, components and associated	UEENEEJ080A	Install and commission ammonia	E

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UEE07 Unit Code – V4	UEE07 Unit Title – V4	UEE07 Unit Code – V3.1	UEE07 Unit Title – V3.1	E = Equivalent N = Not Equivalent -
	equipment		refrigeration systems	
UEENEEJ181A	Design ammonia refrigerated systems	UEENEEJ081A	Design ammonia refrigeration systems	E
UEENEEJ182A	Repair and service secondary refrigeration systems	UEENEEJ082A	Service and repair secondary refrigeration systems	E
UEENEEJ183A	Design secondary refrigerant systems	UEENEEJ083A	Design secondary refrigeration systems	E
UEENEEJ184A	Apply safety awareness and legal requirements for carbon dioxide refrigerant	UEENEEJ084A	Safety awareness in using carbon dioxide as a refrigerant	E
UEENEEJ185A	Repair and service carbon dioxide refrigeration systems	UEENEEJ085A	Service and repair carbon dioxide refrigeration systems	E
UEENEEJ186A	Install and commission carbon dioxide refrigeration systems, components and associated equipment	UEENEEJ086A	Install and commission carbon dioxide refrigeration systems	E
UEENEEJ187A	Design carbon dioxide refrigerated systems	UEENEEJ087A	Design carbon dioxide refrigeration systems	E
UEENEEJ188A	Repair and service self contained carbon dioxide refrigeration and heat pump systems	UEENEEJ088A	Service and repair self contained carbon dioxide refrigeration and heat pump systems	E

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UEE07 Unit Code – V4	**UEE07 Unit Title – V4**	**UEE07 Unit Code – V3.1**	**UEE07 Unit Title – V3.1**	**E = Equivalent** **N = Not Equivalent -**
UEENEEJ189A	Service room air conditioners	UEENEEJ089A	Room air conditioners servicing	E
UEENEEJ190A	Select basic commercial refrigeration system equipment, components and accessories	UEENEEJ090A	Select basic commercial refrigeration system equipment and components	E
UEENEEJ191A	Select residential air conditioning system equipment, components and accessories	UEENEEJ091A	Select residential air conditioning system equipment and components	E
UEENEEJ192A	Analyse the psychrometric performance of HVAC/R systems	UEENEEJ063B	Analyse the psychrometric and thermodynamic performance of HVAC/R systems	E
UEENEEJ193A	Analyse the thermodynamic performance of HVAC/R systems			
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	UEENEEJ053B	Find and rectify faults in appliance motors and associated controls	N
UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances		New Unit	
UEENEEJ196A	Operate Ammonia Refrigeration Plant		New Unit	
UEENEEN021A	Repair rail signalling cables		New Unit	
	Deleted	UEENEEP009B	Locate and rectify faults in electrical low	

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UEE07 Unit Code – V4	UEE07 Unit Title – V4	UEE07 Unit Code – V3.1	UEE07 Unit Title – V3.1	E = Equivalent N = Not Equivalent -
			voltage appliances up to 250V following prescribed procedures	
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	UEENEEP001B	Disconnect and reconnect fixed wired electrical equipment connected to a Low Voltage supply	E
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	UEENEEP007B	Locate and rectify faults in electrical low voltage equipment following prescribed procedures	E
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	UEENEEP002B	Attach cords and plugs to electrical equipment for connection to a single phase 250 Volt supply	E
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	UEENEEP003B	Attach cords and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	E

Table 4 Rationalised Rail Signalling Competencies from TLI07 Transport and Logistics Training Package

The table below maps the rationalised Rail Signalling Competencies from TLI07 Tranpsort and Logistics Training Package transferred to E-Oz Coverage.

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By agreement between the two industry sectors selected Rail Signalling units were deleted from TLI07 and transferred to E-Oz through importation into UEE07 Electrotechnology Training Package. Under this agreement E-Oz is required to map these units to equivalent competencies in The Rail Signalling discipline of UEE07
This mapping should be used to provide RPL and Credit Transfer to candidates seeking recognition of competencies gained under the TLI07 Training Package.

Equivalent unit in UEE07 – V4		**Unit deleted from TLI07 Transport and Logistics Training Package**		**E = Equivalent N = Not Equivalent**
Code	**Title**	**Code**	**Title**	
UEENEEN002B	Assemble and wire internal electrical signalling equipment	TLIB5907B	Assemble and wire internal electrical signalling equipment	E
UEENEEN003B	Install and maintain track circuit leads and bonds	TLIB6207B	Install and maintain track circuit leads and bonds	E
UEENEEN004B	Perform cable tests	TLIB5707B	Perform cable system test	E
UEENEEN005B	Install and maintain signalling power supplies	TLIB6607B	Install and maintain signalling power supplies	E
UEENEEN006B	Maintain remote control and non-vital interlocking control systems	TLIB5007B	Maintain remote control and non-vital interlocking control systems	E
UEENEEN007B	Maintain power signalling and protected level crossing equipment	TLIB5107B	Maintain power signalling and protected level crossing equipment	E
UEENEEN008B	Maintain on site power operated point-activating	TLIB5207B	Maintain on-site power operated point	E

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	devices		activating devices	
UEENEEN009B	Maintain track circuit equipment	TLIB5407B	Install and maintain track circuit equipment	E
UEENEEN010B	Maintain electronic signalling and communication equipment	TLIB6307B	Maintain electronic signalling and communications systems	E
UEENEEN011B	Install and maintain power operated signalling equipment	TLIB6707B	Install and maintain power operated signalling equipment	E
UEENEEN012B	Maintain power signalling and protective relay interlocking systems	TLIB6907B	Maintain power signalling and protective relay interlocking systems	E
UEENEEN013B	Install and test computer based interlocking equipment	TLIS1107B	Install and test computer based and solid state interlocking equipment	E
UEENEEN014B	Maintain computer based and solid state interlocking systems	TLIB5507B	Maintain computer based and solid state interlocking equipment	E
UEENEEN015B	Conduct routine inspecting and testing of new signal cables and lines	TLIB5607B	Conduct route testing of new signal cables/line route	E
UEENEEN016B	Maintain electronic switched and microprocessor-based remote control systems	TLIB6407B	Maintain electronic switched and micro processor-based remote control systems	E
UEENEEN017B	Install and maintain transmission interface equipment	TLIB6507B	Install and maintain transmission interface equipment	E
UEENEEN028B	Test and commission power signalling equipment	TLIS1007B	Test and commission power signalling and protected level crossing equipment	E

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Table 5 – Relationship of UEE07 Electrotechnology Training Package CSUs Version 3 to UEE07 Electrotechnology Training Package CSUs Version 2

Note:
1. RTOs shall ensure appropriate analysis of all the skills and knowledge specified in the respective competency standard units in this Training Package is undertaken with that of the version 2 Training Package (UEE07), in determining equivalence.
2. In granting an equivalence of an UEE07 – V2 unit for a UEE07 – V3 unit:

- - the prerequisite units specified for the UEE07 – V2 unit shall be included
- - the critical aspects of evidence of the UEE07 – V2 unit and its specified prerequisite units shall be at least equal to that of the UEE07 – V3 unit.

3. This table maps only the Qualifications which have changed between these versions.
Table 2 shows the relationship of UEE07 –V3 units to the version 2 Training Package UEE07.

UEE07 Unit Code – V3	**UEE07 Unit Title – V3**	**UEE07 Unit Code – V2**	**UEE07 Unit Title – V2**	**E = Equivalent** **N = Not Equivalent -**
UEENEEE019C	Solve problems in multiple path a.c. circuits	UEENEEE019B	Solve problems in multiple path a.c. circuits	E
UEENEEE024C	Compile and produce an electrotechnology report	UEENEEE024B	Compile and produce an electrotechnology report	E
UEENEEE048C	Carry out routine work activities in an electrotechnology environment	UEENEEE048B	Carry out routine work activities in an electrotechnology environment	E

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UEE07 Unit Code – V3	**UEE07 Unit Title – V3**	**UEE07 Unit Code – V2**	**UEE07 Unit Title – V2**	**E = Equivalent** **N = Not Equivalent -**
UEENEEE079A	Identify and select components, accessories and materials for electrotechnology work activities	UEENEEE040B	Identify and select components/accessories/materials for electrotechnology work activities	E
UEENEEE084A	Write specifications for electrotechnology engineering projects		New Unit, Not previously covered	
UEENEEF016A	Lay and connect cabling for direct access to telecommunications services	UEENEEF001B	Lay and connect cabling for direct access to telecommunication services	E
UEENEEG072C	Investigate and report on electrical incidents	UEENEEG072B	Investigate and report on electrical incidents	E
UEENEEG075A	Develop compliance policies and plans to conduct a contracting business	UEENEEG014B	Develop plans and compliance policies to conduct a contracting business	E
UEENEEH072C	Find and repair faults in communication systems	UEENEEH072B	Find and repair faults in communication systems	E
UEENEEH090A	Provide solutions to air traffic control system problems		New Unit, Not previously covered	

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UEE07 Unit Code – V3	**UEE07 Unit Title – V3**	**UEE07 Unit Code – V2**	**UEE07 Unit Title – V2**	**E = Equivalent** **N = Not Equivalent -**
UEENEEI007C	Install process instrumentation and control cabling and tubing	UEENEEI007B	Install process instrumentation and control cabling and tubing	E
UEENEEI008C	Install process control apparatus and associated equipment	UEENEEI008B	Install process control apparatus and associated equipment	E
UEENEEJ074A	Apply safety awareness and legal requirements for hydrocarbon refrigerants		New Unit, Not previously covered	
UEENEEJ075A	Service and repair self contained hydrocarbon refrigeration systems		New Unit, Not previously covered	
UEENEEJ076A	Install and commission hydrocarbon refrigeration systems, major components and associated equipment		New Unit, Not previously covered	
UEENEEJ077A	Design hydrocarbon refrigeration systems		New Unit, Not previously covered	
UEENEEJ078A	Apply safety awareness in using ammonia as a refrigerant		New Unit, Not previously covered	

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UEE07 Unit Code – V3	UEE07 Unit Title – V3	UEE07 Unit Code – V2	UEE07 Unit Title – V2	E = Equivalent N = Not Equivalent -
UEENEEJ079A	Service and repair ammonia refrigeration systems		New Unit, Not previously covered	
UEENEEJ080A	Install and commission ammonia refrigeration systems		New Unit, Not previously covered	
UEENEEJ081A	Design ammonia refrigeration systems		New Unit, Not previously covered	
UEENEEJ082A	Service and repair secondary refrigeration systems		New Unit, Not previously covered	
UEENEEJ083A	Design secondary refrigeration systems		New Unit, Not previously covered	
UEENEEJ084A	Apply safety awareness for in using carbon dioxide as a refrigerant		New Unit, Not previously covered	
UEENEEJ085A	Service and repair carbon dioxide refrigeration systems		New Unit, Not previously covered	
UEENEEJ086A	Install and commission carbon dioxide refrigeration systems		New Unit, Not previously covered	
UEENEEJ087A	Design complex carbon		New Unit, Not previously covered	

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UEE07 Unit Code – V3	UEE07 Unit Title – V3	UEE07 Unit Code – V2	UEE07 Unit Title – V2	E = Equivalent N = Not Equivalent -
	dioxide refrigeration systems			
UEENEEJ088A	Service and repair self contained carbon dioxide refrigeration and heat pump systems		New Unit, Not previously covered	
UEENEEJ089A	Service room air conditioners servicing	UEENEEJ060B	Service room air conditioners	E
UEENEEJ089A	Service room air conditioners	UEENEEJ060B	Service room air conditioners	E
UEENEEJ090A	Select basic commercial refrigeration system equipment and components		New Unit, Not previously covered	
UEENEEJ091A	Select residential air conditioning system equipment and components		New Unit, Not previously covered	
UEENEEK016A	Maintain and monitor remote area generation facilities		New Unit, Not previously covered	
UEENEEK047A	Maintain and monitor remote area essential service operations		New Unit, Not previously covered	

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UEE07 Unit Code – V3	**UEE07 Unit Title – V3**	**UEE07 Unit Code – V2**	**UEE07 Unit Title – V2**	**E = Equivalent** **N = Not Equivalent -**
UEENEEK049A	Verify compliance and functionality of a renewable energy installation	UEENEEK015B	Verify compliance and functionality of renewable energy installations	E
UEENEEK050A	Assemble and set up photovoltaic apparatus in a domestic dwelling	UEENEEK024B	Assemble and set up photovoltaic apparatus in domestic dwellings	E
UEENEEK051A	Develop effective strategies for energy reduction in buildings	UEENEEK041B	Develop strategies for effective energy reduction in buildings	E
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	UEENEEM002B	Attend to breakdowns in hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM002B (Ex'd'. Ex 'e', Ex 'i', Ex 'p', Ex 't')
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	UEENEEM002B	Attend to breakdowns in hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM002B (Ex'd', Ex 'i', Ex 'e', Ex 'n')

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UEE07 Unit Code – V3	**UEE07 Unit Title – V3**	**UEE07 Unit Code – V2**	**UEE07 Unit Title – V2**	**E = Equivalent** **N = Not Equivalent -**
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	UEENEEM002B	Attend to breakdowns in hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM002B (Ex ‘ i’, Ex ‘t’, Ex ‘p’)
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	UEENEEM002B	Attend to breakdowns in hazardous areas	E, provided endorsement Ex ‘p’ is met in UEENEEM002B
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	UEENEEM004B	Install explosion-protected equipment and wiring systems	E, provided the following endorsements specified in the range statement are met in UEENEEM004B (Ex’d’. Ex ‘e’, Ex ‘i’, Ex ‘p’, Ex ‘t’)
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	UEENEEM004B	Install explosion-protected equipment and wiring systems	E, provided the following endorsements specified in the range statement are met in UEENEEM004B (Ex’d’, Ex ‘i’, Ex ‘e’, Ex ‘n’)
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	UEENEEM004B	Install explosion-protected equipment and wiring systems	E, provided the following endorsements specified in the range statement are met in UEENEEM004B (Ex ‘ i’, Ex

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UEE07 Unit Code – V3	**UEE07 Unit Title – V3**	**UEE07 Unit Code – V2**	**UEE07 Unit Title – V2**	**E = Equivalent** **N = Not Equivalent -**
				‘t’, Ex ‘p’)
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	UEENEEM004B	Install explosion-protected equipment and wiring systems	E, provided endorsement Ex ‘p’ is met in UEENEEM004B
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	UEENEEM006B	Maintain equipment in hazardous areas	E, provided all endorsements specified in the range statement are met in UEENEEM006B
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	UEENEEM006B	Maintain equipment in hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM004B (Ex’d’, Ex ‘i’, Ex ‘e’, Ex ‘n’)
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	UEENEEM006B	Maintain equipment in hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM006B (Ex ‘ i’, Ex ‘t’, Ex ‘p’)
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	UEENEEM006B	Maintain equipment in hazardous areas	E, provided endorsement Ex ‘p’ is met in UEENEEM006B
UEENEEM031A	Overhaul and repair of	UEENEEM007B	Overhaul and repair explosion-protected	E, provided the following

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UEE07 Unit Code – V3	UEE07 Unit Title – V3	UEE07 Unit Code – V2	UEE07 Unit Title – V2	E = Equivalent N = Not Equivalent -
	explosion-protected equipment — coal mining		equipment	endorsements specified in the range statement are met in UEENEEM007B (Ex'd'. Ex 'e', Ex 'i', Ex 'p', Ex 't')
UEENEEM032A	Overhaul and repair of explosion-protected equipment — flameproof enclosures	UEENEEM007B	Overhaul and repair explosion-protected equipment	E, provided all endorsements specified in the range statement are met in UEENEEM007B
UEENEEM033A	Overhaul and repair of explosion-protected equipment — gas atmospheres	UEENEEM007B	Overhaul and repair explosion-protected equipment	E, provided the following endorsements specified in the range statement are met in UEENEEM007B (Ex'd', Ex 'i', Ex 'e', Ex 'n')
UEENEEM034A	Overhaul and repair of explosion-protected equipment — dust atmospheres	UEENEEM007B	Overhaul and repair explosion-protected equipment	E, provided the following endorsements specified in the range statement are met in UEENEEM007B (Ex ' i', Ex 't', Ex 'p')
UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment — coal mining	UEENEEM008B	Assess explosion-protected equipment for compliance with standards	No

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UEE07 Unit Code – V3	**UEE07 Unit Title – V3**	**UEE07 Unit Code – V2**	**UEE07 Unit Title – V2**	**E = Equivalent** **N = Not Equivalent -**
UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment — gas atmospheres	UEENEEM008B	Assess explosion-protected equipment for compliance with standards	No
UEENEEM037A	Conduct a conformity assessment of explosion-protected equipment — dust atmospheres	UEENEEM008B	Assess explosion-protected equipment for compliance with standards	No
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	UEENEEM009B	Test installations in hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM009B (Ex'd'. Ex 'e', Ex 'i', Ex 'p', Ex 't')
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	UEENEEM009B	Test installations in hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM009B (Ex'd', Ex 'i', Ex 'e', Ex 'n')
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	UEENEEM009B	Test installations in hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM009B (Ex ' i', Ex

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UEE07 Unit Code – V3	UEE07 Unit Title – V3	UEE07 Unit Code – V2	UEE07 Unit Title – V2	E = Equivalent N = Not Equivalent -
				‘t’, Ex ‘p’)
UEENEEM041A	Conduct testing of hazardous areas installations — pressurisation	UEENEEM009B	Test installations in hazardous areas	E, provided endorsement Ex ‘p’ is met in UEENEEM009B
UEENEEM042A	Conduct visual inspection of hazardous areas installations	UEENEEM010B	Conduct close inspection of existing hazardous areas installations	E
UEENEEM043A	Conduct detailed inspection of hazardous areas installations — coal mining	UEENEEM011B	Conduct detailed inspection of hazardous areas installations	E, provided the following endorsements specified in the range statement are met in UEENEEM011B (Ex’d’. Ex ‘e’, Ex ‘i’, Ex ‘p’, Ex ‘t’)
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	UEENEEM011B	Conduct detailed inspection of hazardous areas installations	E, provided the following endorsements specified in the range statement are met in UEENEEM011B (Ex’d’, Ex ‘i’, Ex ‘e’, Ex ‘n’)
UEENEEM045A	Conduct detailed inspection of hazardous areas installations — dust atmospheres	UEENEEM011B	Conduct detailed inspection of hazardous areas installations	E, provided the following endorsements specified in the range statement are met in UEENEEM011B (Ex ‘ i’, Ex ‘t’, Ex ‘p’)

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UEE07 Unit Code – V3	**UEE07 Unit Title – V3**	**UEE07 Unit Code – V2**	**UEE07 Unit Title – V2**	**E = Equivalent** **N = Not Equivalent -**
UEENEEM046A	Conduct detailed inspection of hazardous areas installations — pressurisation	UEENEEM011B	Conduct detailed inspection of hazardous areas installations	E, provided endorsement Ex ‘p’ is met in UEENEEM011B
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	UEENEEM012B	Develop and manage maintenance programs for hazardous areas electrical equipment	E, provided the following endorsements specified in the range statement are met in UEENEEM012B (Ex’d’. Ex ‘e’, Ex ‘i’, Ex ‘p’, Ex ‘t’)
UEENEEM048A	Develop and manage maintenance programs for hazardous areas electrical equipment — gas atmospheres	UEENEEM012B	Develop and manage maintenance programs for hazardous areas electrical equipment	E, provided the following endorsements specified in the range statement are met in UEENEEM012B (Ex’d’, Ex ‘i’, Ex ‘e’, Ex ‘n’)
UEENEEM049A	Develop and manage maintenance programs for hazardous areas electrical equipment — dust atmospheres	UEENEEM012B	Develop and manage maintenance programs for hazardous areas electrical equipment	E, provided the following endorsements specified in the range statement are met in UEENEEM012B (Ex ‘ i’, Ex ‘t’, Ex ‘p’)
UEENEEM050A	Develop and manage maintenance programs for hazardous areas electrical	UEENEEM012B	Develop and manage maintenance programs for hazardous areas electrical equipment	E, provided endorsement Ex ‘p’ is met in UEENEEM012B

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UEE07 Unit Code – V3	UEE07 Unit Title – V3	UEE07 Unit Code – V2	UEE07 Unit Title – V2	E = Equivalent N = Not Equivalent -
	equipment — pressurisation			
UEENEEM051A	No unit available as modifications are regarded as manufacturing.	UEENEEM014B	Design and develop modifications to explosion-protected equipment	
UEENEEM052A	Classify hazardous areas — gas atmospheres	UEENEEM015B	Classify hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM015B (Ex'd', Ex 'i', Ex 'e', Ex 'n')
UEENEEM053A	Classify hazardous areas — dust atmospheres	UEENEEM015B	Classify hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM015B (Ex ' i', Ex 't', Ex 'p')
UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	UEENEEM016B	Design electrical installations in hazardous areas	E, provided the following endorsements specified in the range statement are met in UEENEEM016B (Ex'd', Ex 'i', Ex 'e', Ex 'n')
UEENEEM055A	Plan electrical installations for hazardous areas — dust atmospheres	UEENEEM016B	Design electrical installations in hazardous areas	E, provided the following endorsements specified in the range statement are met in

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UEE07 Unit Code – V3	UEE07 Unit Title – V3	UEE07 Unit Code – V2	UEE07 Unit Title – V2	E = Equivalent N = Not Equivalent -
				UEENEEM016B (Ex ‘ i’, Ex ‘t’, Ex ‘p’)
UEENEEM056A	Plan electrical installations for hazardous areas — pressurisation	UEENEEM016B	Design electrical installations in hazardous areas	E, provided endorsement Ex ‘p’ is met in UEENEEM016B
UEENEEM057A	Design explosion-protected electrical systems and installations — gas atmospheres	UEENEEM017B	Design explosion-protected electrical systems	E, provided the following endorsements specified in the range statement are met in UEENEEM017B (Ex’d’, Ex ‘i’, Ex ‘e’, Ex ‘n’)
UEENEEM058A	Design explosion-protected electrical systems and installations — dust atmospheres	UEENEEM017B	Design explosion-protected electrical systems	E, provided the following endorsements specified in the range statement are met in UEENEEM017B (Ex ‘ i’, Ex ‘t’, Ex ‘p’)
UEENEEM059A	Design explosion-protected electrical systems and installations — pressurisation	UEENEEM017B	Design explosion-protected electrical systems	E, provided endorsement Ex ‘p’ is met in UEENEEM017B
UEENEEM060A	Carry out overhaul and repair of explosion-protected equipment — coal mining		New Unit, Not previously covered	

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UEE07 Unit Code – V3	UEE07 Unit Title – V3	UEE07 Unit Code – V2	UEE07 Unit Title – V2	E = Equivalent N = Not Equivalent -
UEENEEM061A	Carry out overhaul and repair of explosion-protected equipment — flameproof enclosures		New Unit, Not previously covered	
UEENEEM062A	Carry out overhaul and repair of explosion-protected equipment — gas atmospheres		New Unit, Not previously covered	
UEENEEM063A	Carry out overhaul and repair of explosion-protected equipment — dust atmospheres		New Unit, Not previously covered	
UEENEEM064A	Conduct audit of hazardous areas installations — coal mining		New Unit, Not previously covered	
UEENEEM065A	Conduct audit of hazardous areas installations — gas atmospheres		New Unit, Not previously covered	
UEENEEM066A	Conduct audit of hazardous areas installations — dust atmospheres		New Unit, Not previously covered	
UEENEEM067A	Assess the fitness-for-purpose		New Unit, Not previously covered	

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UEE07 Unit Code – V3	UEE07 Unit Title – V3	UEE07 Unit Code – V2	UEE07 Unit Title – V2	E = Equivalent N = Not Equivalent -
	of hazardous areas explosion-protected equipment — coal mining			
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — gas atmospheres		New Unit, Not previously covered	
UEENEEM069A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — dust atmospheres		New Unit, Not previously covered	
UEENEEM070A	Repair reeling, trailing and flexible cables		New Unit, Not previously covered	
UEENEEM071A	Test reeling, trailing and flexible cables		New Unit, Not previously covered	
UEENEEM072A	Inspect and fit plugs/couplers for reeling, trailing and flexible cables		New Unit, Not previously covered	
UEENEEM073A	Verify compliance of repaired reeling, trailing and flexible		New Unit, Not previously covered	

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UEE07 Unit Code – V3	UEE07 Unit Title – V3	UEE07 Unit Code – V2	UEE07 Unit Title – V2	E = Equivalent N = Not Equivalent -
	cables			
UEENEEM074A	Plan electrical installations in hazardous areas — Coal mining		New Unit, Not previously covered	
UEENEEM075A	Design explosion-protected electrical systems — *Coal mining*		New Unit, Not previously covered	
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	UEENEEM003B	Use and maintain the integrity of portable gas detection devices	E
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	UEENEEM005B	Install and maintain integrity of fixed gas detection equipment	E
UEENEEM078A	Manage compliance of hazardous areas	UEENEEM013B	Ensure the safety of hazardous areas	E
UEENEEM079A	Design of gas detection systems and installations	UEENEEM018B	Design gas detection systems	E

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UEE07 Unit Code – V3	**UEE07 Unit Title – V3**	**UEE07 Unit Code – V2**	**UEE07 Unit Title – V2**	**E = Equivalent** **N = Not Equivalent -**
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	UEENEEM001B	Report on the integrity of explosion-protected equipment in hazardous areas	E

Table 6 – Relationship of UEE07 Electrotechnology Training Package Version 2 Units to UEE07 Electrotechnology Training Package Version 1 Units

Table 3 shows the relationship of units modified or added in UEE07Electrotechnology Training Package Version 2 to the previous UEE07 Training Package Version 1 for information on all other units refer to Table 4 below, which shows the relationship of units from UEE07 Training Package Version 1 to the former Training Package UEE06.

UEE07 Electrotechnology Training Package Version 2 Unit Code	Title	Relates to previous UEE07 Electrotechnology Training Package Version 1 unit Code	Nature of relationship to units in the former Training Package (UEE07 Version 1)	Equivalent — Full, part or none
	All Existing Qualifications in UEE07 Version 1	All existing qualifications in UEE07 version 1 remain unchanged	Refer to table mapping UEE07 Version 1 qualifications to UEE06 Version 1 for equivalences	

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UEE07 Electrotechnology Training Package Version 2 Unit Code	Title	Relates to previous UEE07 Electrotechnology Training Package Version 1 unit Code	Nature of relationship to units in the former Training Package (UEE07 Version 1)	Equivalent — Full, part or none
UEENEEK025C	Solve basic problems in photovoltaic energy apparatus	UEENEEK025B	Revised version	Full
UEENEEK048A	Install and, configure and commission grid connected photovoltaic power systems	New Unit	New Unit	New Unit
UEENEEK035C	Design grid connected power supply systems	UEENEEK035B	Revised Version	Full
UEENEEG071C	Install and setup interval metering	UEENEEG071B	Revised Version	Full

Table 7 Relationship of UEE07 Electrotechnology Training Package Version 1 Units to UEE06 Electrotechnology Training Package

What follows is a guide to assist RTOs in granting equivalent units when implementing this Training Package.

Note:

1. RTOs shall ensure appropriate analysis of all the skills and knowledge specified in the respective competency standard units in this Training Package is undertaken with that of the former Training Package (UEE06), in determining equivalence.
2. In granting an equivalence of an UEE06 unit for a UEE07 unit:

- the prerequisite units specified for the UEE06 unit shall be included
- the critical aspects of evidence of the UEE06 unit and its specified prerequisite units shall be at least equal to that of the UEE07 unit.

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEA001B	Assemble electronic apparatus	UEENEEA001A	Assemble electronic apparatus	Part - Refer Note 1 (below).
UEENEEA002B	Select electronic components	UEENEEA002A	Select electronic components	Part - Refer Note 1 (below).
UEENEEA003B	Set up and check electronic component placement machines	UEENEEA003A	Set up and check electronic component placement machines	Part - Refer Note 1 (below).
UEENEEA004B	Rework electronic sub assemblies	UEENEEA004A	Rework electronic sub assemblies	Part - Refer Note 1 (below).
UEENEEA005B	Conduct functional and quality tests on assembled electronic apparatus	UEENEEA005A	Conduct functional and quality tests on assembled electronic apparatus	Part - Refer Note 1 (below).
UEENEEA006B	Apply lead-free soldering techniques	UEENEEA006A	Apply lead-free soldering techniques	Part - Refer Note 1 (below).
UEENEEA007A	RESERVED	UEENEEA007A	RESERVED	
UEENEEA008A	RESERVED	UEENEEA008A	RESERVED	
UEENEEA009A	RESERVED	UEENEEA009A	RESERVED	
UEENEEA010B	Assemble; mount and connect switchgear and control gear	UEENEEA010A	Assemble; mount and connect switchgear and control gear	Part - Refer Note 1 (below).
UEENEEA011A	RESERVED	UEENEEA011A	RESERVED	
UEENEEA012B	Make up and assemble bus bars	UEENEEA012A	Make up and assemble bus bars	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEA013B	Assemble and wire control panels	UEENEEA013A	Assemble and wire control panels	Part - Refer Note 1 (below).
UEENEEB001B	Operate and maintain an amateur radio communication station	UEENEEB001A	Operate and maintain an amateur radio communication station	Part - Refer Note 1 (below).
UEENEEC001B	Maintain documentation	UEENEEC001A	Maintain documentation	Part - Refer Note 1 (below).
UEENEEC002B	Source and purchase material/parts for installation or service jobs	UEENEEC002A	Source and purchase material/parts for installation or service jobs	Part - Refer Note 1 (below).
UEENEEC003B	Provide quotations for installation or service jobs	UEENEEC003A	Provide quotations for installation or service jobs	Part - Refer Note 1 (below).
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	UEENEEC004A	Prepare specifications for the supply of materials and equipment for electrotechnology projects	Part - Refer Note 1 (below).
UEENEEC005B	Estimate electrotechnology projects	UEENEEC005A	Estimate electrotechnology projects	Part - Refer Note 1 (below).
UEENEEC006B	Prepare tender submissions for electrotechnology projects	UEENEEC006A	Prepare tender submissions for electrotechnology projects	Part - Refer Note 1 (below).
UEENEEC007B	Manage contract variations	UEENEEC007A	Manage contract variations	Part - Refer Note 1 (below).
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	UEENEEC008A	Receive and store materials and equipment for electrotechnology work	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEC009B	Provide quotations for inspection and compliance audit services	UEENEEC009A	Provide quotations for inspection and compliance audit services	Part - Refer Note 1 (below).
UEENEEC010B	Deliver a service to customers	UEENEEC010A	Deliver a service to customers	Part - Refer Note 1 (below).
UEENEEC011A	RESERVED	UEENEEC011A	RESERVED	
UEENEEC012B	Direct technical and non-technical enquiries to appropriate personnel	UEENEEC012A	Direct technical and non-technical enquiries to appropriate personnel	Part - Refer Note 1 (below).
UEENEEC013B	Participate in business equipment work and competency development activities	UEENEEC013A	Participate in business equipment work and competency development activities	Part - Refer Note 1 (below).
UEENEEC014B	Participate in computer equipment work and competency development activities	UEENEEC014A	Participate in computer equipment work and competency development activities	Part - Refer Note 1 (below).
UEENEEC015B	Participate in custom electronic installations work and competency development activities	UEENEEC015A	Participate in custom electronic installations work and competency development activities	Part - Refer Note 1 (below).
UEENEEC016B	Participate in voice and data communications work and competency development activities	UEENEEC016A	Participate in voice and data communications work and competency development activities	Part - Refer Note 1 (below).
UEENEEC017B	Participate in appliance servicing	UEENEEC017A	Participate in appliance servicing	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	work and competency development activities		work and competency development activities	
UEENEEC018B	Participate in electrical machine repair work and competency development activities	UEENEEC018A	Participate in electrical machine repair work and competency development activities	Part - Refer Note 1 (below).
UEENEEC019B	Participate in switchgear and control gear work and competency development activities	UEENEEC019A	Participate in switchgear and control gear work and competency development activities	Part - Refer Note 1 (below).
UEENEEC020B	Participate in electrical work and competency development activities	UEENEEC020A	Participate in electrical work and competency development activities	Part - Refer Note 1 (below).
UEENEEC021B	Participate in electronics and communications work and competency development activities	UEENEEC021A	Participate in electronics and communications work and competency development activities	Part - Refer Note 1 (below).
UEENEEC022B	Participate in fire protection control work and competency development activities	UEENEEC022A	Participate in fire protection control work and competency development activities	Part - Refer Note 1 (below).
UEENEEC023B	Participate in gaming electronic work and competency development activities	UEENEEC023A	Participate in gaming electronic work and competency development activities	Part - Refer Note 1 (below).
UEENEEC024B	Participate in instrumentation and control work and competency	UEENEEC024A	Participate in instrumentation and control work and competency	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	development activities		development activities	
UEENEEC025B	Participate in refrigeration and air conditioning work and competency development activities	UEENEEC025A	Participate in refrigeration and air conditioning work and competency development activities	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEC026B	Participate in security equipment work and competency development activities	UEENEEC026A	Participate in security equipment work and competency development activities	Part - Refer Note 1 (below).
UEENEEC027B	Participate in rail communications and networks work and competency development activities	UEENEEC027A	Participate in rail communications and networks work and competency development activities	Part - Refer Note 1 (below).
UEENEEC028B	Participate in hazardous areas work and competency development activities	UEENEEC028A	Participate in hazardous areas work and competency development activities	Part - Refer Note 1 (below).
UEENEEC029B	Participate in explosion-protected equipment overhaul work and competency development activities	UEENEEC029A	Participate in explosion-protected equipment overhaul work and competency development activities	Part - Refer Note 1 (below).
UEENEED001B	Use basic computer applications relevant to a workplace	UEENEED001A	Use basic computer applications relevant to a workplace	Part - Refer Note 1 (below).
UEENEED002B	Assemble, set up and test personal computers	UEENEED002A	Assemble, set up and test personal computers	Part - Refer Note 1 (below). Also, removal of all

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
				pre-requisites
UEENEED003B	Evaluate and modify programs written in object oriented code	UEENEED003A	Evaluate and modify programs written in object oriented code	Part - Refer Note 1 (below).
UEENEED004B	Use engineering applications software	UEENEED004A	Use engineering applications software	Part - Refer Note 1 (below).
UEENEED005B	Enter and verify operating instructions in microprocessor equipped devices	UEENEED005A	Enter and verify operating instructions in microprocessor equipped devices	Part - Refer Note 1 (below).
UEENEED006A	RESERVED	UEENEED006A	RESERVED	
UEENEED007B	Develop, enter and verify programs for programmable logic controllers using ladder instruction set	UEENEED007A	Develop, enter and verify programs for programmable logic controllers using ladder instruction set	Part - Refer Note 1 (below).
UEENEED008B	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	UEENEED008A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	Part - Refer Note 1 (below).
UEENEED009B	Develop, enter and verify programs for industrial control systems using high level instructions	UEENEED009A	Develop, enter and verify programs for industrial control systems using high level instructions	Part - Refer Note 1 (below).
UEENEED010B	Set up and create content for a web	UEENEED010A	Set up and create content for a web	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	server		server	
UEENEED011B	Develop object oriented code	UEENEED011A	Develop object oriented code	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED012B	Support computer hardware and software	UEENEED012A	Support computer hardware and software	Part - Refer Note 1 (below).
UEENEED013B	Install and administer Unix based computers	UEENEED013A	Install and administer Unix based computers	Part - Refer Note 1 (below).
UEENEED014B	Design and manage enterprise networks	UEENEED014A	Design and manage enterprise networks	Part _ Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED015B	Administer user networks	UEENEED015A	Administer user networks	Part - Refer Note 1 (below).
UEENEED016B	Develop network services	UEENEED016A	Develop network services	Part - Refer Note 1 (below). Also, removal of UEENEED015B pre-requisite
UEENEED017B	Install and configure Internetworking systems	UEENEED017A	Install and configure Internetworking systems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEED018B	Design and implement Internetworking systems	UEENEED018A	Design and implement Internetworking systems	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED019B	Design and implement Internetworking systems — advanced routing	UEENEED019A	Design and implement Internetworking systems — advanced routing	Part - Refer Note 1 (below). Also, removal of all pre-requisite
UEENEED020B	Design and implement Internetworking systems — remote access	UEENEED020A	Design and implement Internetworking systems — remote access	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED021B	Design and implement Internetworking systems — multi-layer switching	UEENEED021A	Design and implement Internetworking systems — multi-layer switching	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED022B	Design and implement Internetworking systems — security	UEENEED022A	Design and implement Internetworking systems — security	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED023B	Design and implement Internetworking systems — wireless LANs/WANs	UEENEED023A	Design and implement Internetworking systems — wireless LANs/WANs	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED024B	Integrate multiple computer operating systems on a client server network	UEENEED024A	Integrate multiple computer operating systems on a client server network	Part - Refer Note 1 (below). Also, removal of all pre-requisites

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEED025B	Design and configure Human-Machine Interface networks	UEENEED025A	Design and configure Human-Machine Interface networks	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED026B	Design a computer based control system	UEENEED026A	Design a computer based control system	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED027B	Develop structured programs to control sub systems to access external devices	UEENEED027A	Develop structured programs to control sub systems to access external devices	Part - Refer Note 1 (below).
UEENEED028B	Develop and test basic specification code for micro-controller equipped devices	UEENEED028A	Develop and test basic specification code for micro-controller equipped devices	Part - Refer Note 1 (below).
UEENEED029B	Develop basic web pages for engineering applications	UEENEED029A	Develop basic web pages for engineering applications	Part - Refer Note 1 (below).
UEENEED030B	Select, install, configure and test multimedia devices	UEENEED030A	Select, install, configure and test multimedia devices	Part - Refer Note 1 (below).
UEENEED031B	Develop and validate basic integrated systems	UEENEED031A	Develop and validate basic integrated systems	Part - Refer Note 1 (below).
UEENEED032B	Design integrated systems	UEENEED032A	Design integrated systems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEED033B	Design complex integrated systems	UEENEED033A	Design complex integrated systems	Part - Refer Note 1 (below).
UEENEED034B	Configure and maintain industrial control system networks	UEENEED034A	Configure and maintain industrial control system networks	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED035A	RESERVED	UEENEED035A	RESERVED	
UEENEED036A	RESERVED	UEENEED036A	RESERVED	
UEENEED037A	RESERVED	UEENEED037A	RESERVED	
UEENEED038A	RESERVED	UEENEED038A	RESERVED	
UEENEED039A	RESERVED	UEENEED039A	RESERVED	
UEENEED040A	RESERVED	UEENEED040A	RESERVED	
UEENEED041A	RESERVED	UEENEED041A	RESERVED	
UEENEED042A	RESERVED	UEENEED042A	RESERVED	
UEENEED043B	Install and configure a computer operating system and software	UEENEED043A	Install and configure a computer operating system and software	Part - Refer Note 1 (below).
UEENEED044B	Commission computer systems	UEENEED044A	Commission computer systems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEED045B	Modify-redesign of computer system	UEENEED045A	Modify-redesign of computer system	Part - Refer Note 1 (below).
UEENEED046B	Set up and configure basic local area network	UEENEED046A	Set up and configure basic local area network	Part - Refer Note 1 (below).
UEENEED047B	Manage computer projects	UEENEED047A	Manage computer projects	Part - Refer Note 1 (below).
UEENEED048B	Plan computer systems projects	UEENEED048A	Plan computer systems projects	Part - Refer Note 1 (below).
UEENEED049A	RESERVED	UEENEED049A	RESERVED	
UEENEED050B	Develop control programs for micro-computer equipped devices	UEENEED050A	Develop control programs for micro-computer equipped devices	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED051B	Provide programming solution for engineering problems	UEENEED051A	Provide programming solution for engineering problems	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED052B	Design embedded controller systems	UEENEED052A	Design embedded controller systems	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEED053B	Set up and test biometric devices	UEENEED053A	Set up and test biometric devices	Part - Refer Note 1 (below).
UEENEED054B	Analyse and implement biometric techniques and applications	UEENEED054A	Analyse and implement biometric techniques and applications	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEED055B	Develop and validate biometric systems installation instructions	UEENEED055A	Develop and validate biometric systems installation instructions	Part - Refer Note 1 (below).
UEENEEE001B	Apply OHS practices in the workplace	UEENEEE001A	Apply OHS practices in the workplace	Part - Refer Note 1 (below).
UEENEEE002B	Dismantle, assemble and fabricate electrotechnology components	UEENEEE002A	Dismantle, assemble and fabricate electrotechnology components	Part - Refer Note 1 (below).
UEENEEE003B	Solve problems in extra-low voltage single path circuits	UEENEEE003A	Solve problems in extra-low voltage single path circuits	Part - Refer Note 1 (below).
UEENEEE004B	Solve problems in multiple path d.c. circuits	UEENEEE004A	Solve problems in multiple path d.c. circuits	Part - Refer Note 1 (below).
UEENEEE005B	Fix and secure equipment	UEENEEE005A	Fix and secure equipment	Part - Refer Note 1 (below).
UEENEEE006B	Apply methods to maintain currency of industry developments	UEENEEE006A	Apply methods to maintain currency of industry developments	Part - Refer Note 1 (below).
UEENEEE007B	Use drawings, diagrams, schedules and manuals	UEENEEE007A	Use drawings, diagrams, schedules and manuals	Part - Refer Note 1 (below).
UEENEEE008B	Lay wiring/cabling and terminate accessories for extra-low voltage circuits	UEENEEE008A	Lay wiring/cabling and terminate accessories for extra-low voltage circuits	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	UEENEEE009A	Comply with scheduled and preventative maintenance program processes	Part - Refer Note 1 (below).
UEENEEE010B	Develop and implement maintenance programs	UEENEEE010A	Develop and implement maintenance programs	Part - Refer Note 1 (below).
UEENEEE011B	Manage risk in electrotechnology activities	UEENEEE011A	Manage risk in electrotechnology activities	Part - Refer Note 1 (below).
UEENEEE012B	Manage electrotechnology projects	UEENEEE012A	Manage electrotechnology projects	Part - Refer Note 1 (below).
UEENEEE013B	Plan electrotechnology projects	UEENEEE013A	Plan electrotechnology projects	Part - Refer Note 1 (below).
UEENEEE014B	Supervise and coordinate work activities	UEENEEE014A	Supervise and coordinate work activities	Part - Refer Note 1 (below).
UEENEEE015B	Develop design briefs for electrotechnology projects	UEENEEE015A	Develop design briefs for electrotechnology projects	Part - Refer Note 1 (below).
UEENEEE016B	Write specifications for electrotechnology projects	UEENEEE016A	Write specifications for electrotechnology projects	Part - Refer Note 1 (below).
UEENEEE017B	Implement and monitor OHS policies and procedures	UEENEEE017A	Implement and monitor OHS policies and procedures	Part - Refer Note 1 (below).
UEENEEE018B	Establish, maintain and evaluate OHS	UEENEEE018A	Establish, maintain and evaluate OHS	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	systems		systems	
UEENEEE019B	Solve problems in multiple path a.c. circuits	UEENEEE019A	Solve problems in multiple path a.c. circuits	Part - Refer Note 1 (below).
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	UEENEEE020A	Provide basic instruction in the use of electrotechnology apparatus	Part - Refer Note 1 (below).
UEENEEE021B	Plan an integrated cabling system	UEENEEE021A	Plan an integrated cabling system	Part - Refer Note 1 (below).
UEENEEE022B	Carry out preparatory electrotechnology work activities	UEENEEE022A	Carry out preparatory electrotechnology work activities	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEE023B	Solve basic problems in electronic and digital equipment	UEENEEE023A	Solve basic problems in electronic and digital equipment	Part - Refer Note 1 (below).
UEENEEE024C	Compile and produce an electrotechnology report	UEENEEE024A	Compile and produce an electrotechnology report	Part - Refer Note 1 (below).
UEENEEE025B	Solve problems in complex multiple path circuits	UEENEEE025A	Solve problems in complex multiple path circuits	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEE026B	Provide computational solutions to basic engineering problems	UEENEEE026A	Provide computational solutions to basic engineering problems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEE027B	Use advanced computational processes to provide solutions to engineering problems	UEENEEE027A	Use advanced computational processes to provide solutions to engineering problems	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEE028B	Develop engineering solutions to photonic problems	UEENEEE028A	Develop engineering solutions to photonic problems	Part - Refer Note 1 (below).
UEENEEE029B	Solve electrotechnical problems	UEENEEE029A	Solve electrotechnical problems	Part - Refer Note 1 (below).
UEENEEE030B	Provide solutions to and report on routine electrotechnology problems	UEENEEE030A	Provide solutions to and report on routine electrotechnology problems	Part - Refer Note 1 (below).
UEENEEE031A	RESERVED	UEENEEE031A	RESERVED	
UEENEEE032B	Document occupational hazards and risks in computer systems	UEENEEE032A	Document occupational hazards and risks in computer systems	Part - Refer Note 1 (below).
UEENEEE033B	Document occupational hazards and risks in electrical	UEENEEE033A	Document occupational hazards and risks in electrical	Part - Refer Note 1 (below).
UEENEEE034B	Document occupational hazards and risks in electronics	UEENEEE034A	Document occupational hazards and risks in electronics	Part - Refer Note 1 (below).
UEENEEE035B	Document occupational hazards and risks in instrumentation	UEENEEE035A	Document occupational hazards and risks in instrumentation	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEE036B	Document occupational hazards and risks in refrigeration and Air-conditioning	UEENEEE036A	Document occupational hazards and risks in refrigeration and Air-conditioning	Part - Refer Note 1 (below).
UEENEEE037B	Document occupational hazards and risks in electrotechnology	UEENEEE037A	Document occupational hazards and risks in electrotechnology	Part - Refer Note 1 (below).
UEENEEE038B	Participate in development and follow a personal competency development plan	UEENEEE038A	Participate in development and follow a personal competency development plan	Part - Refer Note 1 (below).
UEENEEE039A	RESERVED	UEENEEE039A	RESERVED	
UEENEEE040B	Identify and select components/accessories/materials for electrotechnology work activities	UEENEEE040A	Identify and select components/accessories/materials for electrotechnology work activities	Part - Refer Note 1 (below).
UEENEEE041B	Use of routine equipment/plant/technologies in an electrotechnology environment	UEENEEE041A	Use of routine equipment/plant/technologies in an electrotechnology environment	Part - Refer Note 1 (below).
UEENEEE042B	Produce routine products for carrying out electrotechnology work activities	UEENEEE042A	Produce routine products for carrying out electrotechnology work activities	Part - Refer Note 1 (below).
UEENEEE043B	Produce routine tools/devices for carrying out electrotechnology work activities	UEENEEE043A	Produce routine tools/devices for carrying out electrotechnology work activities	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEE044B	Apply technologies and concepts to electrotechnology work activities	UEENEEE044A	Apply technologies and concepts to electrotechnology work activities	Part - Refer Note 1 (below).
UEENEEE045B	Apply computation when using equipment, materials and concepts in an electrotechnology environment	UEENEEE045A	Apply computation when using equipment, materials and concepts in an electrotechnology environment	Part - Refer Note 1 (below).
UEENEEE046B	Identify affects of energy on machinery and materials in an electrotechnology environment	UEENEEE046A	Identify affects of energy on machinery and materials in an electrotechnology environment	Part - Refer Note 1 (below).
UEENEEE047B	Identify building techniques, methods and materials used in electrotechnology work activities	UEENEEE047A	Identify building techniques, methods and materials used in electrotechnology work activities	Part - Refer Note 1 (below).
UEENEEE048C	Carry out routine work activities in an electrotechnology environment	UEENEEE048A	Carry out routine work activities in an electrotechnology environment	Part - Refer Note 1 (below).
UEENEEE049B	Contribute to the operation of support plant and equipment used in electricity supply	UEENEEE049A	Contribute to the operation of support plant and equipment used in electricity supply	Part - Refer Note 1 (below).
UEENEEE050B	Undertake computations in an electrotechnology environment	UEENEEE050A	Undertake computations in an electrotechnology environment	Part - Refer Note 1 (below).
UEENEEE051B	Transport apparatus and materials	UEENEEE051A	Transport apparatus and materials	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEE052A	RESERVED	UEENEEE052A	RESERVED	
UEENEEE053A	RESERVED	UEENEEE053A	RESERVED	
UEENEEE054A	RESERVED	UEENEEE054A	RESERVED	
UEENEEE055A	RESERVED	UEENEEE055A	RESERVED	
UEENEEE056A	RESERVED	UEENEEE056A	RESERVED	
UEENEEE057A	RESERVED	UEENEEE057A	RESERVED	
UEENEEE058A	RESERVED	UEENEEE058A	RESERVED	
UEENEEE059A	RESERVED	UEENEEE059A	RESERVED	
UEENEEE060B	Provide solutions for uses of materials and thermodynamic effects	UEENEEE060A	Provide solutions for uses of materials and thermodynamic effects	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEE061B	Analyse static and dynamic parameters of equipment	UEENEEE061A	Analyse static and dynamic parameters of equipment	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEE062B	Select drive components for equipment design	UEENEEE062A	Select drive components for equipment design	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEE063B	Analyse materials for suitability in equipment	UEENEEE063A	Analyse materials for suitability in equipment	Part - Refer Note 1 (below).
UEENEEE064B	Design machine drives and production layout plans	UEENEEE064A	Design machine drives and production layout plans	Part - Refer Note 1 (below).
UEENEEE065A	RESERVED	UEENEEE065A	RESERVED	
UEENEEE066A	RESERVED	UEENEEE066A	RESERVED	
UEENEEE067A	RESERVED	UEENEEE067A	RESERVED	
UEENEEE068A	RESERVED	UEENEEE068A	RESERVED	
UEENEEE069A	RESERVED	UEENEEE069A	RESERVED	
UEENEEE070B	Write specifications for computer systems engineering projects	UEENEEE070A	Write specifications for computer systems engineering projects	Part - Refer Note 1 (below).
UEENEEE071B	Write specifications for electrical engineering projects	UEENEEE071A	Write specifications for electrical engineering projects	Part - Refer Note 1 (below).
UEENEEE072B	Write specifications for electronics and communications engineering projects	UEENEEE072A	Write specifications for electronics and communications engineering projects	Part - Refer Note 1 (below).
UEENEEE073B	Write specifications for refrigeration	UEENEEE073A	Write specifications for refrigeration	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	and air conditioning engineering projects		and air conditioning engineering projects	
UEENEEE074B	Write specifications for renewable energy engineering projects	UEENEEE074A	Write specifications for renewable energy engineering projects	Part - Refer Note 1 (below).
UEENEEE075B	Write specifications for industrial electronics and control projects	UEENEEE075A	Write specifications for industrial electronics and control projects	Part - Refer Note 1 (below).
UEENEEE076A	RESERVED	UEENEEE076A	RESERVED	
UEENEEE077B	Write specifications for automated systems projects	UEENEEE077A	Write specifications for automated systems projects	Part - Refer Note 1 (below).
UEENEEE078B	Contribute to risk management in electrotechnology systems	UEENEEE078A	Contribute to risk management in electrotechnology systems	Part - Refer Note 1 (below).
UEENEEF001B	Lay and connect cabling for direct access to telecommunication services	UEENEEF001A	Lay and connect cabling for direct access to telecommunication services	Part - Refer Note 1 (below).
UEENEEF002B	Lay and connect cables for multiple access to telecommunication services	UEENEEF002A	Lay and connect cables for multiple access to telecommunication services	Part - Refer Note 1 (below).
UEENEEF003B	Install and maintain cabling for telecommunication services in lifts	UEENEEF003A	Install and maintain cabling for telecommunication services in lifts	Part - Refer Note 1 (below).
UEENEEF004B	Install and modify performance data	UEENEEF004A	Install and modify performance data	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	communication structured cabling		communication structured cabling	
UEENEEF005B	Install and modify performance data communication optical fibre cabling	UEENEEF005A	Install and modify performance data communication optical fibre cabling	Part - Refer Note 1 (below).
UEENEEF006B	Solve problems in data and voice communications circuits	UEENEEF006A	Solve problems in data and voice communications circuits	Part - Refer Note 1 (below).
UEENEEF007B	Set up the wireless capabilities of communications and data storage devices	UEENEEF007A	Set up the wireless capabilities of communications and data storage devices	Part - Refer Note 1 (below).
UEENEEF008B	Select and arrange equipment for wireless networks	UEENEEF008A	Select and arrange equipment for wireless networks	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEF009B	Install and connect voice and data communications equipment	UEENEEF009A	Install and connect voice and data communications equipment	Part - Refer Note 1 (below).
UEENEEF010B	Select and arrange equipment for local area networks	UEENEEF010A	Select and arrange equipment for local area networks	Part - Refer Note 1 (below).
UEENEEF011B	Test, report and rectify faults in voice and data installations	UEENEEF011A	Test, report and rectify faults in voice and data installations	Part - Refer Note 1 (below).
UEENEEF012B	Install aerial communication cables	UEENEEF012A	Install aerial communication cables	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEF013B	Install below ground communication cables	UEENEEF013A	Install below ground communication cables	Part - Refer Note 1 (below).
UEENEEF014B	Set up and configure basic data communications systems	UEENEEF014A	Set up and configure basic data communications systems	Part - Refer Note 1 (below).
UEENEEF015B	Assemble and connect communication frames and cabinets	UEENEEF015A	Assemble and connect communication frames and cabinets	Part - Refer Note 1 (below).
UEENEEG001B	Solve problems in electromagnetic circuits	UEENEEG001A	Solve problems in electromagnetic circuits	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEG002B	Solve problems in single and three phase low voltage circuits	UEENEEG002A	Solve problems in single and three phase low voltage circuits	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEG003B	Install wiring and accessories for low voltage circuits	UEENEEG003A	Install wiring and accessories for low voltage circuits	Part - Refer Note 1 (below).
UEENEEG004B	Install low voltage electrical apparatus and associated equipment	UEENEEG004A	Install low voltage electrical apparatus and associated equipment	Part - Refer Note 1 (below).
UEENEEG005B	Verify compliance and functionality of general electrical installations	UEENEEG005A	Verify compliance and functionality of general electrical installations	Part - Refer Note 1 (below).
UEENEEG006A	RESERVED	UEENEEG006A	RESERVED	

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEG007B	Select and arrange equipment for general electrical installations	UEENEEG007A	Select and arrange equipment for general electrical installations	Part - Refer Note 1 (below).
UEENEEG008B	Find and repair faults in electrical apparatus and circuits	UEENEEG008A	Find and repair faults in electrical apparatus and circuits	Part - Refer Note 1 (below).
UEENEEG009B	Develop and connect control circuits	UEENEEG009A	Develop and connect control circuits	Part - Refer Note 1 (below).
UEENEEG010B	Find and repair faults in d.c. electrical apparatus and circuits	UEENEEG010A	Find and repair faults in d.c. electrical apparatus and circuits	Part - Refer Note 1 (below).
UEENEEG011B	Carry out basic repairs to electrical apparatus	UEENEEG011A	Carry out basic repairs to electrical apparatus	Part - Refer Note 1 (below).
UEENEEG012B	Solve fundamental problems in electrical systems	UEENEEG012A	Solve fundamental problems in electrical systems	Part - Refer Note 1 (below).
UEENEEG013B	Install and maintain emergency systems.	UEENEEG013A	Install and maintain emergency systems.	Part - Refer Note 1 (below).
UEENEEG014B	Develop plans and compliance policies to conduct a contracting business	UEENEEG014A	Develop plans and compliance policies to conduct a contracting business	Part - Refer Note 1 (below).
UEENEEG015B	Find and rectify faults in energy supply network equipment	UEENEEG015A	Find and rectify faults in energy supply network equipment	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEG016B	Diagnose and rectify faults in lifts systems	UEENEEG016A	Diagnose and rectify faults in lifts systems	Part - Refer Note 1 (below).
UEENEEG017B	Install electrical power and control equipment for rail network signalling	UEENEEG017A	Install electrical power and control equipment for rail network signalling	Part - Refer Note 1 (below).
UEENEEG018B	Maintain operation of electrical mining equipment	UEENEEG018A	Maintain operation of electrical mining equipment	Part - Refer Note 1 (below).
UEENEEG019B	Maintain operation of electrical marine equipment	UEENEEG019A	Maintain operation of electrical marine equipment	Part - Refer Note 1 (below).
UEENEEG020B	Select and arrange equipment for special electrical installations	UEENEEG020A	Select and arrange equipment for special electrical installations	Part - Refer Note 1 (below).
UEENEEG021B	Verify compliance and functionality of special electrical installations	UEENEEG021A	Verify compliance and functionality of special electrical installations	Part - Refer Note 1 (below). Also, removal of pre-requisite UEENEEG020B
UEENEEG022B	Conduct compliance inspection of single phase electrical installations	UEENEEG022A	Conduct compliance inspection of single phase electrical installations	Part - Refer Note 1 (below).
UEENEEG023B	Conduct compliance inspection of electrical installations with demand exceeding 100A per phase	UEENEEG023A	Conduct compliance inspection of electrical installations with demand exceeding 100A per phase	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEG024B	Conduct compliance inspection of special electrical installations	UEENEEG024A	Conduct compliance inspection of special electrical installations	Part - Refer Note 1 (below).
UEENEEG025B	Plan electrical installations with a LV demand up to 400A per phase	UEENEEG025A	Plan electrical installations with a LV demand up to 400A per phase	Part - Refer Note 1 (below).
UEENEEG026B	Install and maintain field power and distribution systems with a LV demand up to 200 A per phase	UEENEEG026A	Install and maintain field power and distribution systems with a LV demand up to 200 A per phase	Part - Refer Note 1 (below).
UEENEEG027B	Design electrical installations with a LV demand greater than 400 A per phase	UEENEEG027A	Design electrical installations with a LV demand greater than 400 A per phase	Part - Refer Note 1 (below).
UEENEEG028B	Plan switchboard and control panel layouts	UEENEEG028A	Plan switchboard and control panel layouts	Part - Refer Note 1 (below).
UEENEEG029B	Overhaul and repair major switchgear/controlgear	UEENEEG029A	Overhaul and repair major switchgear/controlgear	Part - Refer Note 1 (below).
UEENEEG030B	Design switchboards rated for high fault levels	UEENEEG030A	Design switchboards rated for high fault levels	Part - Refer Note 1 (below).
UEENEEG031B	Evaluate performance of electrical apparatus	UEENEEG031A	Evaluate performance of electrical apparatus	Part - Refer Note 1 (below).
UEENEEG032B	Carry out electrical field testing and	UEENEEG032A	Carry out electrical field testing and	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	report findings		report findings	
UEENEEG033A	RESERVED	UEENEEG033A	RESERVED	
UEENEEG034B	Perform high voltage field switching to a given schedule	UEENEEG034A	Perform high voltage field switching to a given schedule	Part - Refer Note 1 (below).
UEENEEG035B	Diagnose and rectify faults in a.c. motor drive systems	UEENEEG035A	Diagnose and rectify faults in a.c. motor drive systems	Part - Refer Note 1 (below).
UEENEEG036B	Diagnose and rectify faults in d.c. motor drive systems	UEENEEG036A	Diagnose and rectify faults in d.c. motor drive systems	Part - Refer Note 1 (below).
UEENEEG037B	Diagnose and rectify faults in energy supply apparatus	UEENEEG037A	Diagnose and rectify faults in energy supply apparatus	Part - Refer Note 1 (below).
UEENEEG038B	Diagnose and rectify faults in electrical energy distribution systems	UEENEEG038A	Diagnose and rectify faults in electrical energy distribution systems	Part - Refer Note 1 (below).
UEENEEG039B	Diagnose and rectify faults in distributed generation systems	UEENEEG039A	Diagnose and rectify faults in distributed generation systems	Part - Refer Note 1 (below).
UEENEEG040B	Develop engineering solutions for energy supply power transformer problems	UEENEEG040A	Develop engineering solutions for energy supply power transformer problems	Part - Refer Note 1 (below).
UEENEEG041B	Diagnose and rectify faults in servo	UEENEEG041A	Diagnose and rectify faults in servo	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	drive systems		drive systems	
UEENEEG042B	Diagnose and rectify faults in electrical energy supply transmission systems	UEENEEG042A	Diagnose and rectify faults in electrical energy supply transmission systems	Part - Refer Note 1 (below).
UEENEEG043B	Develop engineering solution for synchronous machine problems	UEENEEG043A	Develop engineering solution for synchronous machine problems	Part - Refer Note 1 (below).
UEENEEG044B	Develop engineering solutions for d.c. machine problems	UEENEEG044A	Develop engineering solutions for d.c. machine problems	Part - Refer Note 1 (below).
UEENEEG045B	Develop engineering solutions for induction motor problems	UEENEEG045A	Develop engineering solutions for induction motor problems	Part - Refer Note 1 (below).
UEENEEG046B	Develop engineering solutions for energy supply system protection problems	UEENEEG046A	Develop engineering solutions for energy supply system protection problems	Part - Refer Note 1 (below).
UEENEEG047B	Provide computational solutions to power engineering problems	UEENEEG047A	Provide computational solutions to power engineering problems	Part - Refer Note 1 (below).
UEENEEG048B	Solve problems in complex multiple path power circuits	UEENEEG048A	Solve problems in complex multiple path power circuits	Part - Refer Note 1 (below).
UEENEEG049B	Solve problems in complex polyphase	UEENEEG049A	Solve problems in complex polyphase	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	power circuits		power circuits	
UEENEEG050B	Wind coils	UEENEEG050A	Wind coils	Part - Refer Note 1 (below).
UEENEEG051B	Place and connect coils	UEENEEG051A	Place and connect coils	Part - Refer Note 1 (below).
UEENEEG052B	Rewind single phase induction machines	UEENEEG052A	Rewind single phase induction machines	Part - Refer Note 1 (below).
UEENEEG053B	Rewind three phase induction machines rated for low voltage	UEENEEG053A	Rewind three phase induction machines rated for low voltage	Part - Refer Note 1 (below).
UEENEEG054B	Rewind direct current machines rated for low voltage	UEENEEG054A	Rewind direct current machines rated for low voltage	Part - Refer Note 1 (below).
UEENEEG055B	Rewind three phase induction machines rated for high voltage to 3.3 kV	UEENEEG055A	Rewind three phase induction machines rated for high voltage to 3.3 kV	Part - Refer Note 1 (below).
UEENEEG056B	Rewind three phase induction machines rated for high voltage above 3.3 kV	UEENEEG056A	Rewind three phase induction machines rated for high voltage above 3.3 kV	Part - Refer Note 1 (below).
UEENEEG057B	Conduct electrical tests on low voltage electrical machines	UEENEEG057A	Conduct electrical tests on low voltage electrical machines	Part - Refer Note 1 (below).
UEENEEG058B	Conduct electrical tests on high	UEENEEG058A	Conduct electrical tests on high	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	voltage electrical machines		voltage electrical machines	
UEENEEG059B	Conduct mechanical tests on electrical machines	UEENEEG059A	Conduct mechanical tests on electrical machines	Part - Refer Note 1 (below).
UEENEEG060B	Evaluate performance of electrical machines	UEENEEG060A	Evaluate performance of electrical machines	Part - Refer Note 1 (below).
UEENEEG061B	Design and develop modifications to electrical machines	UEENEEG061A	Design and develop modifications to electrical machines	Part - Refer Note 1 (below).
UEENEEG062B	Set up and place electrical apparatus and associated circuits into service	UEENEEG062A	Set up and place electrical apparatus and associated circuits into service	Part - Refer Note 1 (below).
UEENEEG063A	RESERVED	UEENEEG063A	RESERVED	
UEENEEG064B	Repair mechanical components of electrical machines	UEENEEG064A	Repair mechanical components of electrical machines	Part - Refer Note 1 (below).
UEENEEG065B	Maintain and service traction lifts	UEENEEG065A	Maintain and service traction lifts	Part - Refer Note 1 (below).
UEENEEG066B	Installation and maintenance of escalators, moving walks and tread ways	UEENEEG066A	Installation and maintenance of escalators, moving walks and tread ways	Part - Refer Note 1 (below).
UEENEEG067B	Align and install lift equipment	UEENEEG067A	Align and install lift equipment	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEG068B	Diagnose and rectify faults in complex lifts systems	UEENEEG068A	Diagnose and rectify faults in complex lifts systems	Part - Refer Note 1 (below).
UEENEEG069B	Manage electrical projects	UEENEEG069A	Manage electrical projects	Part - Refer Note 1 (below).
UEENEEG070B	Plan electrical projects	UEENEEG070A	Plan electrical projects	Part - Refer Note 1 (below).
UEENEEG071B	Install and set up interval metering	UEENEEG071A	Install and set up interval metering	Part - Refer Note 1 (below).
UEENEEG072B	Investigate and report on electrical incidents	UEENEEG072A	Investigate and report on electrical incidents	Part - Refer Note 1 (below).
UEENEEH001B	Carry out basic repairs to computer equipment by replacement of modules/sub-assemblies	UEENEEH001A	Carry out basic repairs to computer equipment by replacement of modules/sub-assemblies	Part - Refer Note 1 (below).
UEENEEH002B	Carry out basic repairs to electronic apparatus by replacement of components	UEENEEH002A	Carry out basic repairs to electronic apparatus by replacement of components	Part - Refer Note 1 (below). Also, removal of pre-requisites UEENEEE004B and UEENEEE007B
UEENEEH003B	Carry out routine repairs to business equipment	UEENEEH003A	Carry out routine repairs to business equipment	Part - Refer Note 1 (below).
UEENEEH004B	Set up and test residential audio/video	UEENEEH004A	Set up and test residential audio/video	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	equipment		equipment	
UEENEEH005B	Verify compliance and functionality of custom electronic installations	UEENEEH005A	Verify compliance and functionality of custom electronic installations	Part - Refer Note 1 (below).
UEENEEH006B	Assemble and set up fixed audio/video components and systems in buildings and premises	UEENEEH006A	Assemble and set up fixed audio/video components and systems in buildings and premises	Part - Refer Note 1 (below).
UEENEEH007B	Carry out repairs of predictable faults in general electronic apparatus	UEENEEH007A	Carry out repairs of predictable faults in general electronic apparatus	Part - Refer Note 1 (below).
UEENEEH008B	Assemble and erect reception antennae and signal distribution equipment	UEENEEH008A	Assemble and erect reception antennae and signal distribution equipment	Part - Refer Note 1 (below).
UEENEEH009B	Set up and test gaming/games equipment	UEENEEH009A	Set up and test gaming/games equipment	Part - Refer Note 1 (below).
UEENEEH010B	Install commercial audio/video system components	UEENEEH010A	Install commercial audio/video system components	Part - Refer Note 1 (below).
UEENEEH011B	Solve problems in d.c. power supplies with single phase input	UEENEEH011A	Solve problems in d.c. power supplies with single phase input	Part - Refer Note 1 (below). Also, removal of pre-requisite UEENEEH001B.

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEH012B	Solve problems in digital components of electronic apparatus	UEENEEH012A	Solve problems in digital components of electronic apparatus	Part - Refer Note 1 (below). Also, removal of pre-requisite UEENEEH001B and UEENEEH070B
UEENEEH013B	Solve problems in amplifier sections of electronic apparatus	UEENEEH013A	Solve problems in amplifier sections of electronic apparatus	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH014B	Solve problems in frequency dependent circuits	UEENEEH014A	Solve problems in frequency dependent circuits	Part - Refer Note 1 (below). Also, inclusion of 'or UEENEEH069B' in pre-requisite statement
UEENEEH015B	Solve problems in microprocessor based hardware and firmware	UEENEEH015A	Solve problems in microprocessor based hardware and firmware	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH016B	Find and repair faults in the microwave amplifier sections in electronic apparatus	UEENEEH016A	Find and repair faults in the microwave amplifier sections in electronic apparatus	Part - Refer Note 1 (below).
UEENEEH017B	Carry out repairs of predictable faults in audio and video replay/recording	UEENEEH017A	Carry out repairs of predictable faults in audio and video replay/recording	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	apparatus		apparatus	
UEENEEH018B	Find and repair faults in electronic apparatus	UEENEEH018A	Find and repair faults in electronic apparatus	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH019B	Carry out repairs of predictable faults in television receivers	UEENEEH019A	Carry out repairs of predictable faults in television receivers	Part - Refer Note 1 (below).
UEENEEH020B	Find and repair faults in gaming and games equipment	UEENEEH020A	Find and repair faults in gaming and games equipment	Part - Refer Note 1 (below).
UEENEEH021B	Find and repair faults in high volume office equipment	UEENEEH021A	Find and repair faults in high volume office equipment	Part - Refer Note 1 (below).
UEENEEH022B	Find and repair faults in remote control apparatus	UEENEEH022A	Find and repair faults in remote control apparatus	Part - Refer Note 1 (below).
UEENEEH023B	Find and repair faults in microwave heating apparatus	UEENEEH023A	Find and repair faults in microwave heating apparatus	Part - Refer Note 1 (below).
UEENEEH024B	Carry out repairs of predictable faults in audio components	UEENEEH024A	Carry out repairs of predictable faults in audio components	Part - Refer Note 1 (below).
UEENEEH025B	Provide solutions to single phase electronic power control problems	UEENEEH025A	Provide solutions to single phase electronic power control problems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEH026B	Provide solutions to polyphase electronic power control problems	UEENEEH026A	Provide solutions to polyphase electronic power control problems	Part - Refer Note 1 (below).
UEENEEH027B	Commission commercial radio frequency (RF) transmission and reception systems	UEENEEH027A	Commission commercial radio frequency (RF) transmission and reception systems	Part - Refer Note 1 (below).
UEENEEH028B	Install microwave and antennae and waveguides	UEENEEH028A	Install microwave and antennae and waveguides	Part - Refer Note 1 (below).
UEENEEH029B	Diagnose and rectify faults in navigation systems	UEENEEH029A	Diagnose and rectify faults in navigation systems	Part - Refer Note 1 (below).
UEENEEH030B	Diagnose and rectify faults in satellite-based surveillance and observation systems	UEENEEH030A	Diagnose and rectify faults in satellite-based surveillance and observation systems	Part - Refer Note 1 (below).
UEENEEH031B	Diagnose and rectify faults in radar apparatus and systems	UEENEEH031A	Diagnose and rectify faults in radar apparatus and systems	Part - Refer Note 1 (below).
UEENEEH032B	Diagnose and rectify faults in global positioning systems	UEENEEH032A	Diagnose and rectify faults in global positioning systems	Part - Refer Note 1 (below).
UEENEEH033B	Diagnose and rectify faults in telecommunication apparatus and systems	UEENEEH033A	Diagnose and rectify faults in telecommunication apparatus and systems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEH034B	Diagnose and rectify faults in electronic medical equipment	UEENEEH034A	Diagnose and rectify faults in electronic medical equipment	Part - Refer Note 1 (below).
UEENEEH035B	Design custom electronic installations	UEENEEH035A	Design custom electronic installations	Part - Refer Note 1 (below).
UEENEEH036B	Design commercial audio/video installations	UEENEEH036A	Design commercial audio/video installations	Part - Refer Note 1 (below).
UEENEEH037B	Program and commission commercial audio/video systems	UEENEEH037A	Program and commission commercial audio/video systems	Part - Refer Note 1 (below).
UEENEEH038B	Find and repair faults in complex power supplies	UEENEEH038A	Find and repair faults in complex power supplies	Part - Refer Note 1 (below).
UEENEEH039B	Solve problems in basic amplifier circuits	UEENEEH039A	Solve problems in basic amplifier circuits	Part - Refer Note 1 (below). Also, removal of pre-requisite UEENEEH070BA
UEENEEH040B	Diagnose and rectify faults in sonar apparatus and systems	UEENEEH040A	Diagnose and rectify faults in sonar apparatus and systems	Part - Refer Note 1 (below).
UEENEEH041B	Manage and implement electronic projects	UEENEEH041A	Manage and implement electronic projects	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEH042B	Solve problems in oscillator sections of electronic apparatus	UEENEEH042A	Solve problems in oscillator sections of electronic apparatus	Part - Refer Note 1 (below). Also, removal of pre-requisite UEENEEE007B.
UEENEEH043B	Diagnose and rectify faults in digital subsystems of electronic controls	UEENEEH043A	Diagnose and rectify faults in digital subsystems of electronic controls	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH044B	Diagnose and rectify faults in analogue circuits and components in electronic control systems	UEENEEH044A	Diagnose and rectify faults in analogue circuits and components in electronic control systems	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH045B	Develop solutions to analogue electronic problems	UEENEEH045A	Develop solutions to analogue electronic problems	Part - Refer Note 1 (below).
UEENEEH046B	Solve fundamental problems in electronic communications systems	UEENEEH046A	Solve fundamental problems in electronic communications systems	Part - Refer Note 1 (below).
UEENEEH047B	Assess compliance of electronic apparatus	UEENEEH047A	Assess compliance of electronic apparatus	Part - Refer Note 1 (below).
UEENEEH048B	Design and develop advanced digital systems	UEENEEH048A	Design and develop advanced digital systems	Part - Refer Note 1 (below). Also, removal of all pre-requisites

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEH049B	Develop solutions to audio electronic problems	UEENEEH049A	Develop solutions to audio electronic problems	Part - Refer Note 1 (below).
UEENEEH050B	Assemble and set up basic wired and wireless security systems	UEENEEH050A	Assemble and set up basic wired and wireless security systems	Part - Refer Note 1 (below).
UEENEEH051B	Install large wired and wireless security systems	UEENEEH051A	Install large wired and wireless security systems	Part - Refer Note 1 (below).
UEENEEH052B	Enter instructions and test basic wired and wireless security systems	UEENEEH052A	Enter instructions and test basic wired and wireless security systems	Part - Refer Note 1 (below).
UEENEEH053B	Program and test large wired and wireless security systems	UEENEEH053A	Program and test large wired and wireless security systems	Part - Refer Note 1 (below).
UEENEEH054B	Program and commission commercial security alarm systems	UEENEEH054A	Program and commission commercial security alarm systems	Part - Refer Note 1 (below).
UEENEEH055B	Program and commission commercial security access control systems	UEENEEH055A	Program and commission commercial security access control systems	Part - Refer Note 1 (below).
UEENEEH056B	Program and commission commercial security closed circuit television (CCTV) systems	UEENEEH056A	Program and commission commercial security closed circuit television (CCTV) systems	Part - Refer Note 1 (below).
UEENEEH057B	Develop basic integrated security systems plan	UEENEEH057A	Develop basic integrated security systems plan	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEH058B	Design integrated security systems for a single site	UEENEEH058A	Design integrated security systems for a single site	Part - Refer Note 1 (below).
UEENEEH059B	Design integrated complex security systems	UEENEEH059A	Design integrated complex security systems	Part - Refer Note 1 (below).
UEENEEH060B	Plan electronic projects	UEENEEH060A	Plan electronic projects	Part - Refer Note 1 (below).
UEENEEH061B	Position and terminate fire detection and warning system apparatus	UEENEEH061A	Position and terminate fire detection and warning system apparatus	Part - Refer Note 1 (below).
UEENEEH062B	Verify compliance and functionality of fire protection installations	UEENEEH062A	Verify compliance and functionality of fire protection installations	Part - Refer Note 1 (below).
UEENEEH063B	Enter and verify programs in preparation for commissioning fire protection systems	UEENEEH063A	Enter and verify programs in preparation for commissioning fire protection systems	Part - Refer Note 1 (below).
UEENEEH064B	Commission commercial fire protection systems	UEENEEH064A	Commission commercial fire protection systems	Part - Refer Note 1 (below).
UEENEEH065B	Find and repair faults in fire protection systems	UEENEEH065A	Find and repair faults in fire protection systems	Part - Refer Note 1 (below).
UEENEEH066B	Fault find Microcontroller based hardware	UEENEEH066A	Fault find Microcontroller based hardware	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEH067B	Commission electronics and communications systems	UEENEEH067A	Commission electronics and communications systems	Part - Refer Note 1 (below).
UEENEEH068B	Modify-redesign of electronics and communications system	UEENEEH068A	Modify-redesign of electronics and communications system	Part - Refer Note 1 (below).
UEENEEH069B	Solve problems in electronic circuits	UEENEEH069A	Solve problems in electronic circuits	Part - Refer Note 1 (below).
UEENEEH070B	Terminate and connect components, conductors, wiring and cables for electronic circuits	UEENEEH070A	Terminate and connect components, conductors, wiring and cables for electronic circuits	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH071B	Find and repair faults in television receivers	UEENEEH071A	Find and repair faults in television receivers	Part - Refer Note 1 (below).
UEENEEH072B	Find and repair faults in the RF sections of electronic apparatus	UEENEEH072A	Find and repair faults in the RF sections of electronic apparatus	Part - Refer Note 1 (below). Also, removal of pre-requisites UEENEEH012B; UEENEEH013B and UEENEEH038B. Inclusion of pre-requisite UEENEEH046B

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEH073B	Find and repair faults in professional audio reproduction components	UEENEEH073A	Find and repair faults in professional audio reproduction components	Part - Refer Note 1 (below).
UEENEEH074B	Find and repair faults in audio/video recording equipment	UEENEEH074A	Find and repair faults in audio/video recording equipment	Part - Refer Note 1 (below).
UEENEEH075B	Find and rectify faults and malfunctions in security system installations	UEENEEH075A	Find and rectify faults and malfunctions in security system installations	Part - Refer Note 1 (below).
UEENEEH076B	Diagnose and rectify faults in display circuits	UEENEEH076A	Diagnose and rectify faults in display circuits	Part - Refer Note 1 (below).
UEENEEH077B	Diagnose and rectify faults in recording and replay apparatus	UEENEEH077A	Diagnose and rectify faults in recording and replay apparatus	Part - Refer Note 1 (below).
UEENEEH078B	Diagnose and rectify faults in camera circuits	UEENEEH078A	Diagnose and rectify faults in camera circuits	Part - Refer Note 1 (below).
UEENEEH079B	Diagnose and rectify faults in digital television apparatus	UEENEEH079A	Diagnose and rectify faults in digital television apparatus	Part - Refer Note 1 (below).
UEENEEH080B	Diagnose and rectify faults in digital transmission systems	UEENEEH080A	Diagnose and rectify faults in digital transmission systems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEH081B	Design printed circuit boards	UEENEEH081A	Design printed circuit boards	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH082B	Develop solutions to RF amplifiers problems	UEENEEH082A	Develop solutions to RF amplifiers problems	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH083B	Analyse the performance of wireless-based electronic systems	UEENEEH083A	Analyse the performance of wireless-based electronic systems	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH084B	Design DSP-based systems	UEENEEH084A	Design DSP-based systems	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH085B	Design electronic data acquisition systems	UEENEEH085A	Design electronic data acquisition systems	Part - Refer Note 1 (below). Also, removal of all pre-requisites
UEENEEH086B	Commission microwave and satellite communication systems	UEENEEH086A	Commission microwave and satellite communication systems	Part - Refer Note 1 (below).
UEENEEH087B	Solve problems in musical equipment circuits	UEENEEH087A	Solve problems in musical equipment circuits	Part - Refer Note 1 (below).
UEENEEH088B	Design and develop	UEENEEH088A	Design and develop	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	electronics/computer systems project		electronics/computer systems project	
UEENEEI001B	Install and set up transducers and sensing devices	UEENEEI001A	Install and set up transducers and sensing devices	Part - Refer Note 1 (below).
UEENEEI002B	Solve problems in pressure measurement systems	UEENEEI002A	Solve problems in pressure measurement systems	Part - Refer Note 1 (below).
UEENEEI003B	Solve problems in density/level measurement systems	UEENEEI003A	Solve problems in density/level measurement systems	Part - Refer Note 1 (below).
UEENEEI004B	Solve problems in flow measurement systems	UEENEEI004A	Solve problems in flow measurement systems	Part - Refer Note 1 (below).
UEENEEI005B	Solve problems in temperature measurement systems	UEENEEI005A	Solve problems in temperature measurement systems	Part - Refer Note 1 (below).
UEENEEI006B	Solve problems in process controllers, transmitters and converters	UEENEEI006A	Solve problems in process controllers, transmitters and converters	Part - Refer Note 1 (below).
UEENEEI007B	Install process instrumentation and control cabling and tubing	UEENEEI007A	Install process instrumentation and control cabling and tubing	Part - Refer Note 1 (below).
UEENEEI008B	Install process control apparatus and associated equipment	UEENEEI008A	Install process control apparatus and associated equipment	Part - Refer Note 1 (below).
UEENEEI009B	Set up process measuring and control	UEENEEI009A	Set up process measuring and control	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	instruments		instruments	
UEENEEI010B	Set up and adjust process control loops	UEENEEI010A	Set up and adjust process control loops	Part - Refer Note 1 (below).
UEENEEI011B	Find and rectify faults in process control valve and associated equipment	UEENEEI011A	Find and rectify faults in process control valve and associated equipment	Part - Refer Note 1 (below).
UEENEEI012B	Verify compliance and functionality of process control installations	UEENEEI012A	Verify compliance and functionality of process control installations	Part - Refer Note 1 (below).
UEENEEI013B	Select equipment for process control systems	UEENEEI013A	Select equipment for process control systems	Part - Refer Note 1 (below).
UEENEEI014B	Find and rectify faults in process control systems	UEENEEI014A	Find and rectify faults in process control systems	Part - Refer Note 1 (below).
UEENEEI015B	Find and rectify faults in medical equipment control systems	UEENEEI015A	Find and rectify faults in medical equipment control systems	Part - Refer Note 1 (below).
UEENEEI016A	RESERVED	UEENEEI016A	RESERVED	
UEENEEI017B	Calibrate and test measuring instruments	UEENEEI017A	Calibrate and test measuring instruments	Part - Refer Note 1 (below).
UEENEEI018A	RESERVED	UEENEEI018A	RESERVED	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEI019B	Set up field control devices	UEENEEI019A	Set up field control devices	Part - Refer Note 1 (below).
UEENEEI020B	Provide solutions to problems in basic industrial control systems	UEENEEI020A	Provide solutions to problems in basic industrial control systems	Part - Refer Note 1 (below).
UEENEEI021B	Find and repair faults in measuring and analysis systems	UEENEEI021A	Find and repair faults in measuring and analysis systems	Part - Refer Note 1 (below).
UEENEEI022B	Assist in commissioning process control systems	UEENEEI022A	Assist in commissioning process control systems	Part - Refer Note 1 (below).
UEENEEI023B	Design electronic control systems	UEENEEI023A	Design electronic control systems	Part - Refer Note 1 (below).
UEENEEI024A	RESERVED	UEENEEI024A	RESERVED	
UEENEEI025B	Provide solutions to fluid circuit operations	UEENEEI025A	Provide solutions to fluid circuit operations	Part - Refer Note 1 (below).
UEENEEI026B	Provide solutions to pneumatic/hydraulic system operations	UEENEEI026A	Provide solutions to pneumatic/hydraulic system operations	Part - Refer Note 1 (below).
UEENEEI027B	Analyse complex electronic circuits controlling fluids	UEENEEI027A	Analyse complex electronic circuits controlling fluids	Part - Refer Note 1 (below).
UEENEEI028B	Set up controls on complex fluid systems	UEENEEI028A	Set up controls on complex fluid systems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEI029B	Set up electronically controlled mechanically operated complex systems	UEENEEI029A	Set up electronically controlled mechanically operated complex systems	Part - Refer Note 1 (below).
UEENEEI030B	Set up electronically controlled robotically operated complex systems	UEENEEI030A	Set up electronically controlled robotically operated complex systems	Part - Refer Note 1 (below).
UEENEEI031A	RESERVED	UEENEEI031A	RESERVED	
UEENEEI032A	RESERVED	UEENEEI032A	RESERVED	
UEENEEI033B	RESERVED	UEENEEI033A	RESERVED	
UEENEEI034B	Manage control projects	UEENEEI033A	Manage control projects	Part - Refer Note 1 (below).
UEENEEI035B	Plan control projects	UEENEEI035A	Plan control projects	Part - Refer Note 1 (below).
UEENEEI036B	Manage automated systems projects	UEENEEI036A	Manage automated systems projects	Part - Refer Note 1 (below).
UEENEEI037B	Plan automated systems projects	UEENEEI037A	Plan automated systems projects	Part - Refer Note 1 (below).
UEENEEJ001A	RESERVED	UEENEEJ001A	RESERVED	
UEENEEJ002B	Prepare refrigerant tubing and fittings	UEENEEJ002A	Prepare refrigerant tubing and fittings	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEJ003B	Determine the basic operating conditions of vapour compression systems	UEENEEJ003A	Determine the basic operating conditions of vapour compression systems	Part - Refer Note 1 (below).
UEENEEJ004B	Determine the basic operating conditions of air conditioning systems	UEENEEJ004A	Determine the basic operating conditions of air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ005B	Position, assemble and start up split air conditioning systems	UEENEEJ005A	Position, assemble and start up split air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ006B	Install pipe work for refrigeration and air conditioning systems	UEENEEJ006A	Install pipe work for refrigeration and air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ007B	Install refrigeration and air conditioning systems, major components and associated equipment	UEENEEJ007A	Install refrigeration and air conditioning systems, major components and associated equipment	Part - Refer Note 1 (below).
UEENEEJ008B	Recover, pressure and leak test, evacuate and charge refrigerants	UEENEEJ008A	Recover, pressure and leak test, evacuate and charge refrigerants	Part - Refer Note 1 (below).
UEENEEJ009B	Verify compliance and functionality of refrigeration and air conditioning installations	UEENEEJ009A	Verify compliance and functionality of refrigeration and air conditioning installations	Part - Refer Note 1 (below).
UEENEEJ010B	Select refrigerant pipe/tube, accessories and associated controls	UEENEEJ010A	Select refrigerant pipe/tube, accessories and associated controls	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEJ011B	Diagnose and rectify faults in refrigeration and air conditioning systems and components	UEENEEJ011A	Diagnose and rectify faults in refrigeration and air conditioning systems and components	Part - Refer Note 1 (below).
UEENEEJ012B	Diagnose and rectify faults in complex refrigeration/air conditioning systems	UEENEEJ012A	Diagnose and rectify faults in complex refrigeration/air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ013B	Commission refrigeration and air conditioning systems	UEENEEJ013A	Commission refrigeration and air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ014B	Solve problems in hydronic systems	UEENEEJ014A	Solve problems in hydronic systems	Part - Refer Note 1 (below).
UEENEEJ015B	Solve problems in beverage dispensers	UEENEEJ015A	Solve problems in beverage dispensers	Part - Refer Note 1 (below).
UEENEEJ016B	Solve problems in transport refrigeration systems	UEENEEJ016A	Solve problems in transport refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ017B	Solve problems in ultra-low temperature refrigeration systems	UEENEEJ017A	Solve problems in ultra-low temperature refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ018B	Solve problems in post mix refrigeration systems	UEENEEJ018A	Solve problems in post mix refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ019B	Solve problems in ice making systems	UEENEEJ019A	Solve problems in ice making systems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEJ020B	Solve problems in industrial refrigeration systems	UEENEEJ020A	Solve problems in industrial refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ021B	Monitor and adjust energy management systems on refrigeration systems	UEENEEJ021A	Monitor and adjust energy management systems on refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ022B	Diagnose faults in complex refrigeration or HVAC control systems	UEENEEJ022A	Diagnose faults in complex refrigeration or HVAC control systems	Part - Refer Note 1 (below).
UEENEEJ023B	Commission complex heating, ventilation and air conditioning (HVAC) systems	UEENEEJ023A	Commission complex heating, ventilation and air conditioning (HVAC) systems	Part - Refer Note 1 (below).
UEENEEJ024B	Commission hydronic systems for refrigeration and/or air conditioning	UEENEEJ024A	Commission hydronic systems for refrigeration and/or air conditioning	Part - Refer Note 1 (below).
UEENEEJ025B	Commission complex refrigeration systems	UEENEEJ025A	Commission complex refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ026B	Commission complex control systems for refrigeration/air conditioning systems	UEENEEJ026A	Commission complex control systems for refrigeration/air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ027B	Determine thermodynamic parameters of refrigeration and air conditioning	UEENEEJ027A	Determine thermodynamic parameters of refrigeration and air conditioning	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	systems		systems	
UEENEEJ028B	Produce HVAC/R design drawings	UEENEEJ028A	Produce HVAC/R design drawings	Part - Refer Note 1 (below).
UEENEEJ029B	Determine the heat loads for commercial refrigeration and air conditioning applications	UEENEEJ029A	Determine the heat loads for commercial refrigeration and air conditioning applications	Part - Refer Note 1 (below).
UEENEEJ030B	Produce HVAC/R control system design diagrams	UEENEEJ030A	Produce HVAC/R control system design diagrams	Part - Refer Note 1 (below).
UEENEEJ031B	Provide solutions to vibration problems in HVAC/R system design	UEENEEJ031A	Provide solutions to vibration problems in HVAC/R system design	Part - Refer Note 1 (below).
UEENEEJ032B	Design commercial refrigeration systems	UEENEEJ032A	Design commercial refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ033B	Design industrial refrigeration systems	UEENEEJ033A	Design industrial refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ034B	Design heating, ventilation and air conditioning (HVAC) systems	UEENEEJ034A	Design heating, ventilation and air conditioning (HVAC) systems	Part - Refer Note 1 (below).
UEENEEJ035B	Design control systems for a heating, ventilation, air conditioning or refrigeration system	UEENEEJ035A	Design control systems for a heating, ventilation, air conditioning or refrigeration system	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEJ036B	Evaluate and report on energy management	UEENEEJ036A	Evaluate and report on energy management	Part - Refer Note 1 (below).
UEENEEJ037B	Evaluate and report on air quality in buildings	UEENEEJ037A	Evaluate and report on air quality in buildings	Part - Refer Note 1 (below).
UEENEEJ038B	Analyse noise and vibration in refrigeration and air conditioning systems	UEENEEJ038A	Analyse noise and vibration in refrigeration and air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ039B	Develop specifications and prepare drawings for HVAC/R projects	UEENEEJ039A	Develop specifications and prepare drawings for HVAC/R projects	Part - Refer Note 1 (below).
UEENEEJ040B	Manage refrigeration and air conditioning projects	UEENEEJ040A	Manage refrigeration and air conditioning projects	Part - Refer Note 1 (below).
UEENEEJ041B	Design complex commercial refrigeration systems	UEENEEJ041A	Design complex commercial refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ042B	Design complex industrial refrigeration systems	UEENEEJ042A	Design complex industrial refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ043B	Design complex air conditioning systems	UEENEEJ043A	Design complex air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ044B	Design mechanical ventilation/exhaust systems	UEENEEJ044A	Design mechanical ventilation/exhaust systems	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEJ045B	Design hydronic systems	UEENEEJ045A	Design hydronic systems	Part - Refer Note 1 (below).
UEENEEJ046B	Design complex control systems for a heating, ventilation, air conditioning or refrigeration system	UEENEEJ046A	Design complex control systems for a heating, ventilation, air conditioning or refrigeration system	Part - Refer Note 1 (below).
UEENEEJ047B	Audit energy use for commercial HVAC/R systems	UEENEEJ047A	Audit energy use for commercial HVAC/R systems	Part - Refer Note 1 (below).
UEENEEJ048B	Analyse HVAC control systems for compliance with standards and regulations	UEENEEJ048A	Analyse HVAC control systems for compliance with standards and regulations	Part - Refer Note 1 (below).
UEENEEJ049B	Develop specifications for heat exchanger designs	UEENEEJ049A	Develop specifications for heat exchanger designs	Part - Refer Note 1 (below).
UEENEEJ050B	Evaluate alternative and new technologies applicable to electrotechnology applications	UEENEEJ050A	Evaluate alternative and new technologies applicable to electrotechnology applications	Part - Refer Note 1 (below).
UEENEEJ051B	Service small appliances and power tools	UEENEEJ051A	Service small appliances and power tools	Part - Refer Note 1 (below).
UEENEEJ052B	Carry out repairs to appliance refrigeration systems	UEENEEJ052A	Carry out repairs to appliance refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ053B	Find and rectify faults in appliance	UEENEEJ053A	Find and rectify faults in appliance	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	motors and associated controls		motors and associated controls	
UEENEEJ054B	Find and rectify faults in appliance control devices and systems	UEENEEJ054A	Find and rectify faults in appliance control devices and systems	Part - Refer Note 1 (below). Also, removal of pre-requisite UEENEEJ009B
UEENEEJ055B	Service refrigerated appliances	UEENEEJ055A	Service refrigerated appliances	Part - Refer Note 1 (below).
UEENEEJ056B	Service clothes washers and dryers	UEENEEJ056A	Service clothes washers and dryers	Part - Refer Note 1 (below).
UEENEEJ057B	Service electric heating appliances	UEENEEJ057A	Service electric heating appliances	Part - Refer Note 1 (below).
UEENEEJ058B	Service dish washing machines	UEENEEJ058A	Service dish washing machines	Part - Refer Note 1 (below).
UEENEEJ059B	Service gas appliances	UEENEEJ059A	Service gas appliances	Part - Refer Note 1 (below).
UEENEEJ060B	Service room air conditioners	UEENEEJ060A	Service room air conditioners	Part - Refer Note 1 (below).
UEENEEJ061B	Verify compliance and functionality of appliances	UEENEEJ061A	Verify compliance and functionality of appliances	Part - Refer Note 1 (below).
UEENEEJ062B	Recover, pressure and leak test, evacuate and charge refrigerants/appliances	UEENEEJ062A	Recover, pressure and leak test, evacuate and charge refrigerants/appliances	Part - Refer Note 1 (below).
UEENEEJ063B	Analyse the psychrometric and thermodynamic performance of	UEENEEJ063A	Analyse the psychrometric and thermodynamic performance of	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	HVAC/R systems		HVAC/R systems	
UEENEEJ064B	Analyse the operation of HVAC/R systems	UEENEEJ064A	Analyse the operation of HVAC/R systems	Part - Refer Note 1 (below).
UEENEEJ065B	Evaluate fluid and thermodynamic parameters of refrigeration systems	UEENEEJ065A	Evaluate fluid and thermodynamic parameters of refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ066B	Solve problems in diary refrigeration systems	UEENEEJ066A	Solve problems in diary refrigeration systems	Part - Refer Note 1 (below).
UEENEEJ067B	Solve problems in central plant air conditioning systems	UEENEEJ067A	Solve problems in central plant air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ068B	Maintain microbial control of air and water systems	UEENEEJ068A	Maintain microbial control of air and water systems	Part - Refer Note 1 (below).
UEENEEJ069B	Plan refrigeration and air conditioning projects	UEENEEJ069A	Plan refrigeration and air conditioning projects	Part - Refer Note 1 (below).
UEENEEJ070B	Diagnose and rectify faults in refrigeration and air conditioning control systems	UEENEEJ070A	Diagnose and rectify faults in refrigeration and air conditioning control systems	Part - Refer Note 1 (below).
UEENEEJ071B	Solve problems in refrigerated beverage vending cabinets	UEENEEJ071A	Solve problems in refrigerated beverage vending cabinets	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEJ072B	Recover, pressure and leak test, evacuate and charge refrigerants – split air conditioning systems	UEENEEJ072A	Recover, pressure and leak test, evacuate and charge refrigerants – split air conditioning systems	Part - Refer Note 1 (below).
UEENEEJ073B	Service microwave ovens	UEENEEJ073A	Service microwave ovens	Part - Refer Note 1 (below).
UEENEEK001B	Maintain safety and tidiness of remote area power supply (RAPS) systems	UEENEEK001A	Maintain safety and tidiness of remote area power supply (RAPS) systems	Part - Refer Note 1 (below).
UEENEEK002B	Work safely with remote area power supply (RAPS) systems	UEENEEK002A	Work safely with remote area power supply (RAPS) systems	Part - Refer Note 1 (below).
UEENEEK003B	Conduct periodic maintenance of remote area power supply (RAPS) battery banks	UEENEEK003A	Conduct periodic maintenance of remote area power supply (RAPS) battery banks	Part - Refer Note 1 (below).
UEENEEK004B	Conduct periodic maintenance of remote area power supply (RAPS) generator sets	UEENEEK004A	Conduct periodic maintenance of remote area power supply (RAPS) generator sets	Part - Refer Note 1 (below).
UEENEEK005B	Conduct periodic maintenance of remote area power supply (RAPS) photo voltaic arrays	UEENEEK005A	Conduct periodic maintenance of remote area power supply (RAPS) photo voltaic arrays	Part - Refer Note 1 (below).
UEENEEK006B	Conduct periodic maintenance of remote area power supply (RAPS) wind generators	UEENEEK006A	Conduct periodic maintenance of remote area power supply (RAPS) wind generators	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEK007B	Conduct checks in the demand side use of remote area power supplies	UEENEEK007A	Conduct checks in the demand side use of remote area power supplies	Part - Refer Note 1 (below).
UEENEEK008B	Plan periodic maintenance schedules of remote area power supplies	UEENEEK008A	Plan periodic maintenance schedules of remote area power supplies	Part - Refer Note 1 (below).
UEENEEK009B	Attend to breakdowns in remote area power supplies	UEENEEK009A	Attend to breakdowns in remote area power supplies	Part - Refer Note 1 (below).
UEENEEK010B	Coordinate maintenance of renewable energy apparatus and systems	UEENEEK010A	Coordinate maintenance of renewable energy apparatus and systems	Part - Refer Note 1 (below).
UEENEEK011B	Assemble and connect remote area power supplies (RAPS)	UEENEEK011A	Assemble and connect remote area power supplies (RAPS)	Part - Refer Note 1 (below).
UEENEEK012B	Provide basic sustainable energy solutions for energy reduction in domestic premises	UEENEEK012A	Provide basic sustainable energy solutions for energy reduction in domestic premises	Part - Refer Note 1 (below).
UEENEEK013B	Apply sustainable energy practice in daily activities	UEENEEK013A	Apply sustainable energy practice in daily activities	Part - Refer Note 1 (below).
UEENEEK014B	Promote sustainable energy practice in the community	UEENEEK014A	Promote sustainable energy practice in the community	Part - Refer Note 1 (below).
UEENEEK015A	RESERVED	UEENEEK015A	RESERVED	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEK016A	RESERVED	UEENEEK016A	RESERVED	Part - Refer Note 1 (below).
UEENEEK017B	Maintain and repair facilities associated with remote area essential services operation	UEENEEK017A	Maintain and repair facilities associated with remote area essential services operation	Part - Refer Note 1 (below).
UEENEEK018B	Maintain operation of remote area water facilities	UEENEEK018A	Maintain operation of remote area water facilities	Part - Refer Note 1 (below).
UEENEEK019B	Maintain operation of remote area waste water facilities	UEENEEK019A	Maintain operation of remote area waste water facilities	Part - Refer Note 1 (below).
UEENEEK020B	Maintain operation of remote area power plant	UEENEEK020A	Maintain operation of remote area power plant	Part - Refer Note 1 (below).
UEENEEK021B	Manage renewable energy projects	UEENEEK021A	Manage renewable energy projects	Part - Refer Note 1 (below).
UEENEEK022B	Plan renewable energy projects	UEENEEK022A	Plan renewable energy projects	Part - Refer Note 1 (below).
UEENEEK023B	Carry out basic repairs to renewable energy apparatus by replacement of components	UEENEEK023A	Carry out basic repairs to renewable energy apparatus by replacement of components	Part - Refer Note 1 (below).
UEENEEK024B	Assemble and set up photovoltaic apparatus in domestic dwellings	UEENEEK024A	Assemble and set up photovoltaic apparatus in domestic dwellings	Part - Refer Note 1 (below).
UEENEEK025B	Solve basic problems in photovoltaic	UEENEEK025A	Solve basic problems in photovoltaic	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	energy apparatus		energy apparatus	
UEENEEK026B	Install and set up grid connected photovoltaic power systems	UEENEEK026A	Install and set up grid connected photovoltaic power systems	Part - Refer Note 1 (below).
UEENEEK027B	Diagnose faults in renewable energy control systems	UEENEEK027A	Diagnose faults in renewable energy control systems	Part - Refer Note 1 (below).
UEENEEK028B	Solve problems in stand-alone renewable energy systems	UEENEEK028A	Solve problems in stand-alone renewable energy systems	Part - Refer Note 1 (below).
UEENEEK029B	Design renewable energy heating systems	UEENEEK029A	Design renewable energy heating systems	Part - Refer Note 1 (below).
UEENEEK030B	Solve problems in wind energy conversion systems	UEENEEK030A	Solve problems in wind energy conversion systems	Part - Refer Note 1 (below).
UEENEEK031B	Design wind energy conversion systems rated to 10kW	UEENEEK031A	Design wind energy conversion systems rated to 10kW	Part - Refer Note 1 (below).
UEENEEK032B	Develop strategies to address sustainability issues	UEENEEK032A	Develop strategies to address sustainability issues	Part - Refer Note 1 (below).
UEENEEK033B	Design hybrid power systems	UEENEEK033A	Design hybrid power systems	Part - Refer Note 1 (below).
UEENEEK034B	Install stand-alone photovoltaic power systems	UEENEEK034A	Install stand-alone photovoltaic power systems	Part – Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEK035B	Design grid connected power supply systems	UEENEEK035A	Design grid connected power supply systems	Part - Refer Note 1 (below).
UEENEEK036A	Prepare grid connected photovoltaic power systems for LV connection	UEENEEK036A	Prepare grid connected photovoltaic power systems for LV connection	Part – Refer Note 1 (below).
UEENEEK037B	Install and set up micro-hydro systems	UEENEEK037A	Install and set up micro-hydro systems	Part - Refer Note 1 (below).
UEENEEK038B	Design micro-hydro systems	UEENEEK038A	Design micro-hydro systems	Part - Refer Note 1 (below).
UEENEEK039B	Design stand-alone renewable energy systems	UEENEEK039A	Design stand-alone renewable energy systems	Part - Refer Note 1 (below).
UEENEEK040B	Develop engineering solutions to renewable energy problems	UEENEEK040A	Develop engineering solutions to renewable energy problems	Part - Refer Note 1 (below).
UEENEEK041B	Develop strategies for effective energy reduction in buildings	UEENEEK041A	Develop strategies for effective energy reduction in buildings	Part - Refer Note 1 (below).
UEENEEK042A	Participate in environmentally sustainable work practices	NEW		
UEENEEK043A	Install small wind energy conversion systems for stand-alone applications	NEW		
UEENEEK044A	RESERVED	UEENEEK044A	RESERVED	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEK045A	Implement & monitor policies & procedures for environmentally sustainable electrotech work practice	NEW		
UEENEEK046A	Design energy management controls for electrical installations in buildings	NEW		
UEENEEM001B	Report on the integrity of explosion-protected equipment in hazardous areas	UEENEEM001A	Report on the integrity of explosion-protected equipment in hazardous areas	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM002B	Attend to breakdowns in hazardous areas	UEENEEM002A	Attend to breakdowns in hazardous areas	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM003B	Use and maintain the integrity of portable gas detection devices	UEENEEM003A	Use and maintain the integrity of portable gas detection devices	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM004B	Install explosion-protected equipment and wiring systems	UEENEEM004A	Install explosion-protected equipment and wiring systems	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM005B	Install and maintain integrity of fixed gas detection equipment	UEENEEM005A	Install and maintain integrity of fixed gas detection equipment	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEM006B	Maintain equipment in hazardous areas	UEENEEM006A	Maintain equipment in hazardous areas	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM007B	Overhaul and repair explosion-protected equipment	UEENEEM007A	Overhaul and repair explosion-protected equipment	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM008B	Assess explosion-protected equipment for compliance with standards	UEENEEM008A	Assess explosion-protected equipment for compliance with standards	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM009B	Test installations in hazardous areas	UEENEEM009A	Test installations in hazardous areas	Part - Refer Note 1.
UEENEEM010B	Conduct close inspection of existing hazardous areas installations	UEENEEM010A	Conduct close inspection of existing hazardous areas installations	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM011B	Conduct detailed inspection of hazardous areas installations	UEENEEM011A	Conduct detailed inspection of hazardous areas installations	Part - Refer Note 1 (below).
UEENEEM012B	Develop and manage maintenance programs for hazardous areas electrical equipment	UEENEEM012A	Develop and manage maintenance programs for hazardous areas electrical equipment	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEM013B	Ensure the safety of hazardous areas	UEENEEM013A	Ensure the safety of hazardous areas	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM014B	Design and develop modifications to explosion-protected equipment	UEENEEM014A	Design and develop modifications to explosion-protected equipment	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM015B	Classify hazardous areas	UEENEEM015A	Classify hazardous areas	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM016B	Design electrical installations in hazardous areas	UEENEEM016A	Design electrical installations in hazardous areas	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM017B	Design explosion-protected electrical systems	UEENEEM017A	Design explosion-protected electrical systems	Part - Refer Note 1 (below). Also, amendment of pre-requisite statement
UEENEEM018B	Design gas detection systems	UEENEEM018A	Design gas detection systems	Part - Refer Note 1 (below).
UEENEEN001B	Service mechanical signalling equipment and infrastructure	UEENEEN001A	Service mechanical signalling equipment and infrastructure	Part - Refer Note 1 (below).
UEENEEN002B	Assemble and wire internal electrical	UEENEEN002A	Assemble and wire internal electrical	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	signalling equipment		signalling equipment	
UEENEEN003B	Install and maintain track circuit leads and bonds	UEENEEN003A	Install and maintain track circuit leads and bonds	Part - Refer Note 1 (below).
UEENEEN004B	Perform cable tests	UEENEEN004A	Perform cable tests	Part - Refer Note 1 (below).
UEENEEN005B	Install and maintain signalling power supplies	UEENEEN005A	Install and maintain signalling power supplies	Part - Refer Note 1 (below).
UEENEEN006B	Maintain remote control and non-vital interlocking control systems	UEENEEN006A	Maintain remote control and non-vital interlocking control systems	Part - Refer Note 1 (below).
UEENEEN007B	Maintain power signalling and protected level crossing equipment	UEENEEN007A	Maintain power signalling and protected level crossing equipment	Part - Refer Note 1 (below).
UEENEEN008B	Maintain on-site power operated point-activating devices	UEENEEN008A	Maintain on-site power operated point-activating devices	Part - Refer Note 1 (below).
UEENEEN009B	Maintain track circuits equipment	UEENEEN009A	Maintain track circuits equipment	Part - Refer Note 1 (below).
UEENEEN010B	Maintain electronic signalling and communication equipment	UEENEEN010A	Maintain electronic signalling and communication equipment	Part - Refer Note 1 (below).
UEENEEN011B	Install and maintain power operated signalling equipment	UEENEEN011A	Install and maintain power operated signalling equipment	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEN012B	Maintain power signalling and protective relay interlocking systems	UEENEEN012A	Maintain power signalling and protective relay interlocking systems	Part - Refer Note 1 (below).
UEENEEN013B	Install and test computer based interlocking equipment	UEENEEN013A	Install and test computer based interlocking equipment	Part - Refer Note 1 (below).
UEENEEN014B	Maintain computer based and solid state interlocking equipment	UEENEEN014A	Maintain computer based and solid state interlocking equipment	Part - Refer Note 1 (below).
UEENEEN015B	Conduct routine inspecting and testing of new signal cables and lines	UEENEEN015A	Conduct routine inspecting and testing of new signal cables and lines	Part - Refer Note 1 (below).
UEENEEN016B	Maintain electronic switched and microprocessor-based remote control systems	UEENEEN016A	Maintain electronic switched and microprocessor-based remote control systems	Part - Refer Note 1 (below).
UEENEEN017B	Install and maintain transmission interface equipment	UEENEEN017A	Install and maintain transmission interface equipment	Part - Refer Note 1 (below).
UEENEEN018B	Find and repair cable system faults	UEENEEN018A	Find and repair cable system faults	Part - Refer Note 1 (below).
UEENEEN019B	Test equipment and isolate faults	UEENEEN019A	Test equipment and isolate faults	Part - Refer Note 1 (below).
UEENEEN020B	Install electrical power and control equipment for rail networks	UEENEEN020A	Install electrical power and control equipment for rail networks	Part - Refer Note 1 (below).
UEENEEN021A	RESERVED	UEENEEN021A	RESERVED	

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEN022A	RESERVED	UEENEEN022A	RESERVED	
UEENEEN023A	RESERVED	UEENEEN023A	RESERVED	
UEENEEN024A	RESERVED	UEENEEN024A	RESERVED	
UEENEEN025B	Coordinate and manage track protection	UEENEEN025A	Coordinate and manage track protection	Part - Refer Note 1 (below).
UEENEEN026B	Develop rail signalling maintenance programmes	UEENEEN026A	Develop rail signalling maintenance programmes	Part - Refer Note 1 (below).
UEENEEN027B	Decommission electrical and electro-mechanical signalling from service	UEENEEN027A	Decommission electrical and electro-mechanical signalling from service	Part - Refer Note 1 (below).
UEENEEN028B	Test and commission power signalling equipment	UEENEEN028A	Test and commission power signalling equipment	Part - Refer Note 1 (below).
UEENEEP001B	Disconnect and reconnect fixed wired electrical equipment connected to a low voltage supply	UEENEEP001A	Disconnect and reconnect fixed wired electrical equipment connected to a low voltage supply	Part - Refer Note 1 (below). Also, amendment of EKAS alignments
UEENEEP002B	Attach cords and plugs to electrical equipment for connection to a single phase 250 volt supply	UEENEEP002A	Attach cords and plugs to electrical equipment for connection to a single phase 250 volt supply	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
UEENEEP003B	Attach cords and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	UEENEEP003A	Attach cords and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	Part - Refer Note 1 (below).
UEENEEP004B	Disconnect and reconnect explosion-protected electrical equipment connected to low voltage supply	UEENEEP004A	Disconnect and reconnect explosion-protected electrical equipment connected to low voltage supply	Part - Refer Note 1 (below).
UEENEEP005B	Disconnect and reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles	UEENEEP005A	Disconnect and reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles	Part - Refer Note 1 (below).
UEENEEP006B	Attach flexible cables and plugs to electrical equipment connected to a high voltage supply	UEENEEP006A	Attach flexible cables and plugs to electrical equipment connected to a high voltage supply	Part - Refer Note 1 (below).
UEENEEP007B	Locate and rectify faults in electrical low voltage equipment following prescribed procedures	UEENEEP007A	Locate and rectify faults in electrical low voltage equipment following prescribed procedures	Part - Refer Note 1 (below).
UEENEEP008B	Conduct in-service safety testing of electrical cord assemblies and cord connected equipment	UEENEEP008A	Conduct in-service safety testing of electrical cord assemblies and cord connected equipment	Part - Refer Note 1 (below).
UEENEEP009B	Locate and rectify faults in electrical low voltage appliances up to 250V	UEENEEP009A	Locate and rectify faults in electrical low voltage appliances up to 250V	Part - Refer Note 1 (below).

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UEE07 Unit Code	UEE07 Unit Title	UEE06 Unit Code	UEE06 Unit Title (previous Training Package)	Equivalence - Full, Part, No
	following prescribed procedures		following prescribed procedures	
UEENEER001B	Contribute to the planning of a research project	UEENEER001A	Contribute to the planning of a research project	Part - Refer Note 1 (below).
UEENEER002B	Contribute to the conduct of a research project	UEENEER002A	Contribute to the conduct of a research project	Part - Refer Note 1 (below).
UEENEER003B	Contribute to the development of a product/application/service	UEENEER003A	Contribute to the development of a product/application/service	Part - Refer Note 1 (below).
UEENEER004B	Contribute to the trial of a product/application/service	UEENEER004A	Contribute to the trial of a product/application/service	Part - Refer Note 1 (below).
UEENEER005B	Contribute to intellectual property management	UEENEER005A	Contribute to intellectual property management	Part - Refer Note 1 (below).
UEENEER006B	Contribute to the commercialisation of a product/application/service	UEENEER006A	Contribute to the commercialisation of a product/application/service	Part - Refer Note 1 (below).

Note:
1. All units have been amended as follows:

- Removal of all spaces within unit codes
- Addition of ‘1.1 Descriptor’ as a new title
- Relocation of ‘3.1 License to practise’ to position 1.2
- Relocation of the sub-heading ‘2.1 Competencies’ from the left hand column to the right hand column

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- Relocation of the sub-heading ‘2.2 Literacy and Numeracy skills’ from the left hand column to the right hand column
- Inclusion of the statement *"For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2"* in 2.1 Competencies
- Removal of all guidance text from 2) Prerequisite Unit(s), with the exception of the ‘M’ Hazardous Areas units
- Inclusion of ‘3) Employability Skills’ and the statement *"The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements."* as a whole new section
- Revision of the numbering of all subsequent sections to accommodate the inclusion of the Employability Skills section at 3)
- Inclusion of the statement *"All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies"* as a new paragraph in ‘7) Required Skills and Knowledge’
- Changing of the number ‘7’ in paragraph *"Solve problems in complex polyphase power circuits as described in **7)** and including:"* in section 9.2 of the unit to 8.
- Complete removal of the ‘Key Competencies’ and ‘Skills Enabling Employment’ sections.

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1.3.00 Assessment Guidelines

Volume 1 Part 3

Assessment Guidelines

1.3.01 Introduction

3.1 Introduction

These Assessment Guidelines provide the endorsed framework for assessment of the units of competency in this Training Package. They are designed to ensure that assessment is consistent with the current Australian Quality Training Framework *Australian Quality Training Framework (AQTF) Essential Standards for Initial and Continuing Registration* and Standards for NVR Registered Training Organisations 2012. Assessments against the competency standard units in this Training Package must be carried out in accordance with these Assessment Guidelines.

Note:
1. Using this guideline to support any assessment strategy or process does not remove the responsibility of employers and employees to ensure appropriate 'duty of care' arrangements are maintained under relevant occupational health and safety legislation, and any other prevailing legislation, regulation, standard or code. RTOs should recognise this in their assessment processes and provide requisite advice.
2. In the assessment process it should be acknowledged that State/Territory regulatory requirements and/or Codes of Practice may vary. Therefore there may be a requirement for the demonstration of a greater range of items to those specified in respective Competency Standard Units. RTOs should incorporate this in their assessment processes and practices.

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1.3.02 Assessment System Overview

3.2 Assessment System Overview

This section provides an overview of the requirements for assessment when using this Training Package, including a summary of the AQTF/NVR requirements; licensing/registration requirements; and assessment pathways. By way of supporting, and reinforcing, both the concept of competency and the competency standard unit, the Electrotechnology Industry embraces the following principles:

- Wherever practicable, summative (or final) assessment is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment.
- All persons may claim formal recognition for an assessment of an individual competency standard unit or a group of units.
- All persons have the right to have relevant competencies recognised through the most expeditious assessment system and method.

Quality assessment underpins the credibility of the vocational education and training sector. The Assessment Guidelines of a Training Package are an important tool in supporting quality assessment.
Assessment within the National Skills Framework is the process of collecting evidence and making judgements about whether competency has been achieved to confirm whether an individual can perform to the standards expected in the workplace, as expressed in the relevant endorsed unit of competency.
Assessment must be carried out in accordance with the:
- benchmarks for assessment
- specific industry requirements [where industry specific requirements are adequately covered by the Training Package Assessment Guidelines Mandatory Text, this dot point should be deleted]
- principles of assessment
- rules of evidence
- assessment requirements set out in the AQTF or Standards for NVR Registered Training Organisations 2012

1.3.03 Pathways

3.3 Pathways

The competencies in this Training Package may be attained in a number of ways including through:

- formal or informal education and training
- experiences in the workplace
- general life experience and/or
- any combination of the above.

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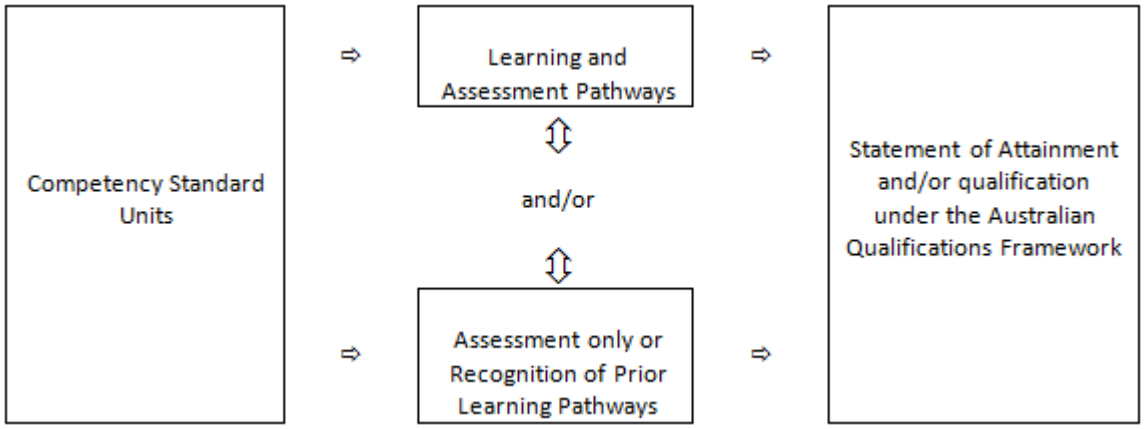
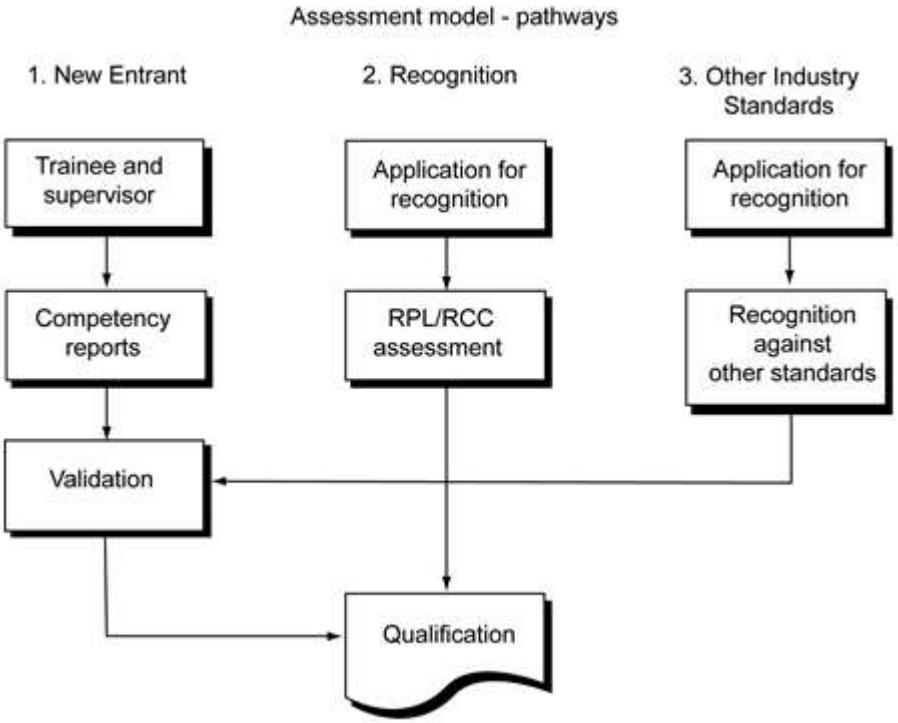
Assessment under Training Packages leading to an AQF qualification or Statement of Attainment may follow a learning and assessment pathway, an assessment-only or recognition pathway or a combination of the two as illustrated below.



Each of these assessment pathways leads to full recognition of competencies held – the critical issue is that the candidate is competent, not how the competency was acquired. Assessment, by any pathway, must comply with the assessment requirements set out in the Assessment Guidelines of the Training Package and the AQTF or NVR.
Within the general Training Package Pathways framework three distinct Assessment Pathways have been identified for use within the Electrotechnology Industry.
Pathway 1: New entrant competency development
Pathway 2: Recognition of currently held competencies or prior learning and workplace experience
Pathway 3: Recognition of other currently held competencies (other industry standards)



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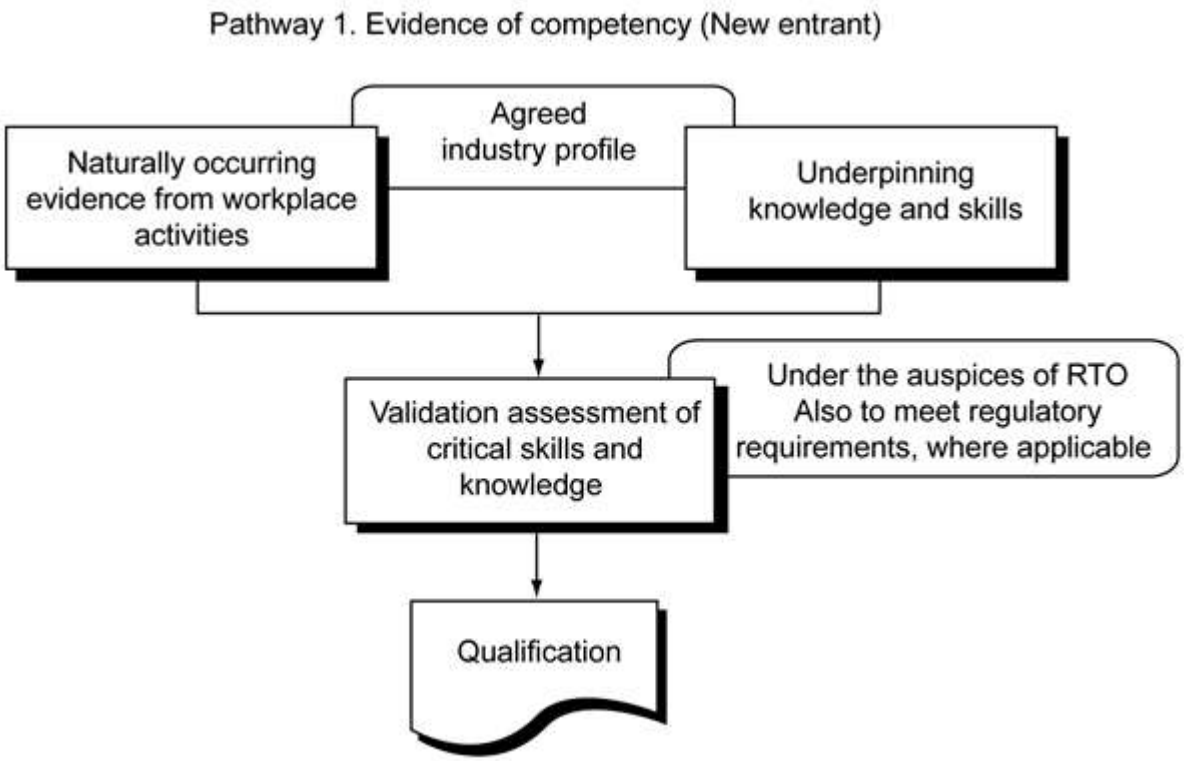
Although not exclusive, the three pathways provide typical recognition processes for individual competency standard units or groups of units that make up Qualifications or Statements of Attainment.

Pathway 1: New Entrant Competency Development

This pathway is for individuals who are undertaking an industry-preferred competency development plan. The users of this pathway may be:

- contracted employment based employees who are generally Australian Apprentices and who undertake an approved training program that supports a competency development plan, **or**
- those who undertake an approved structured training program in an institutional environment to achieve competency outcomes.

Evidence of Competency
In Pathway 1 evidence required to determine competence for the issuance of the qualification or Statement of Attainment is to be in accordance with the later section **3.4 Assessment principles within the Electrotechnology Industry**. The evidence however, must be sufficient in quality, quantity and type and be gathered in an on-going basis in a timely and accurate manner from several sources, such as, workplace and educational experiences based on the approved industry training program and related competency development plan in which individuals are involved.



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Pathway 2: Recognition of prior learning/current competencies (RPL/RCC)

This pathway is for those who may have acquired skills and knowledge in relevant competency standard units outside formally recognised processes. The users of this pathway will include applicants from overseas and also applicants who have developed skills in allied industries but who have no formal recognition in respect of industry standards or qualifications. In using this pathway RTOs should also identify if any equivalence mapping document exists as per Pathway 3.

An existing national mechanism for recognition as a tradesperson exists under the *Tradesmen's' Rights Regulation Act*, which is administered by *Trades Recognition Australia (TRA)* – part of the *Commonwealth Department of Industrial Relations*. TRA grants recognition for the purposes of migration but further analysis of the applicant's knowledge and skills is often needed before competency can be attributed.

The TRA process mainly operates to provide formal recognition of the knowledge and skills migrants possess as a result of structured training and/or work experience in overseas countries. However, it is also an important mechanism for the assessment and recognition of the competencies of those who may not have had access to the industry-preferred new entrant model of competency development for trade vocations in Australia. For further information on these requirements visit:

http://www.workplace.gov.au/workplace/Category/SchemesInitiatives/TRA/TRA-TradeClassificationsAssessed.htm

Evidence of Competency

In Pathway 2 many types of evidence can be used to determine competency for the issuance of qualifications or Statements of Attainment. The evidence may come from records of previous relevant work experience. This type of evidence will need endorsement by a supervisor/mentor skilled in the units for which recognition is sought. Evidence may consist of portfolios such as projects or products completed for other purposes, or from non-registered training programs or ad hoc prior experience, or from overseas programs of a similar nature.

Industry would expect this evidence to be assessed by the RTO (or its nominee – a qualified industry assessor). The result will be that the applicant is judged competent for the competency standard unit(s) or gaps are identified and noted. Where a gap is identified, the applicant can either accept the judgement and pursue gap training or elect to appeal the decision. Evidence used in the appeal process may include a personal portfolio, relevant work history, interview, comments by peers or employers, and challenge tests.

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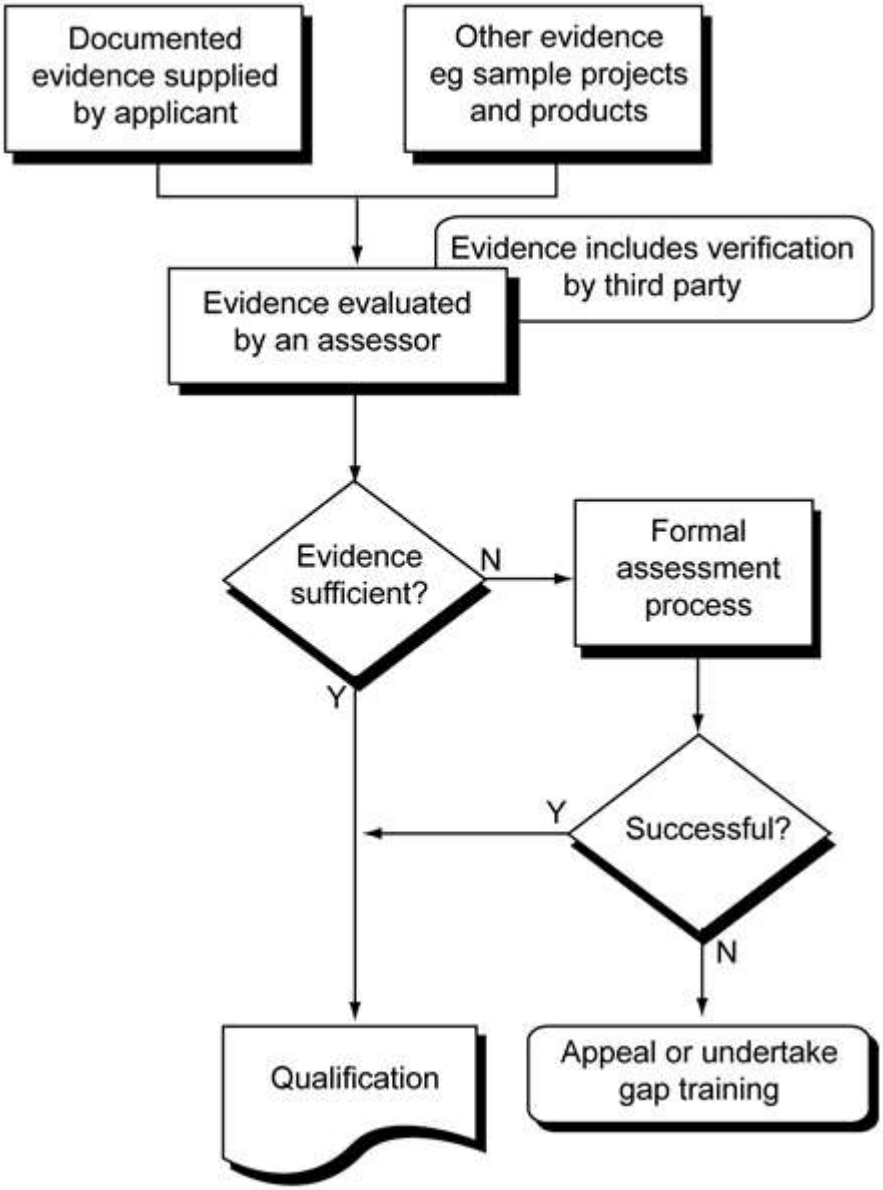
Pathway 2. Recognition (RPL/RCC)



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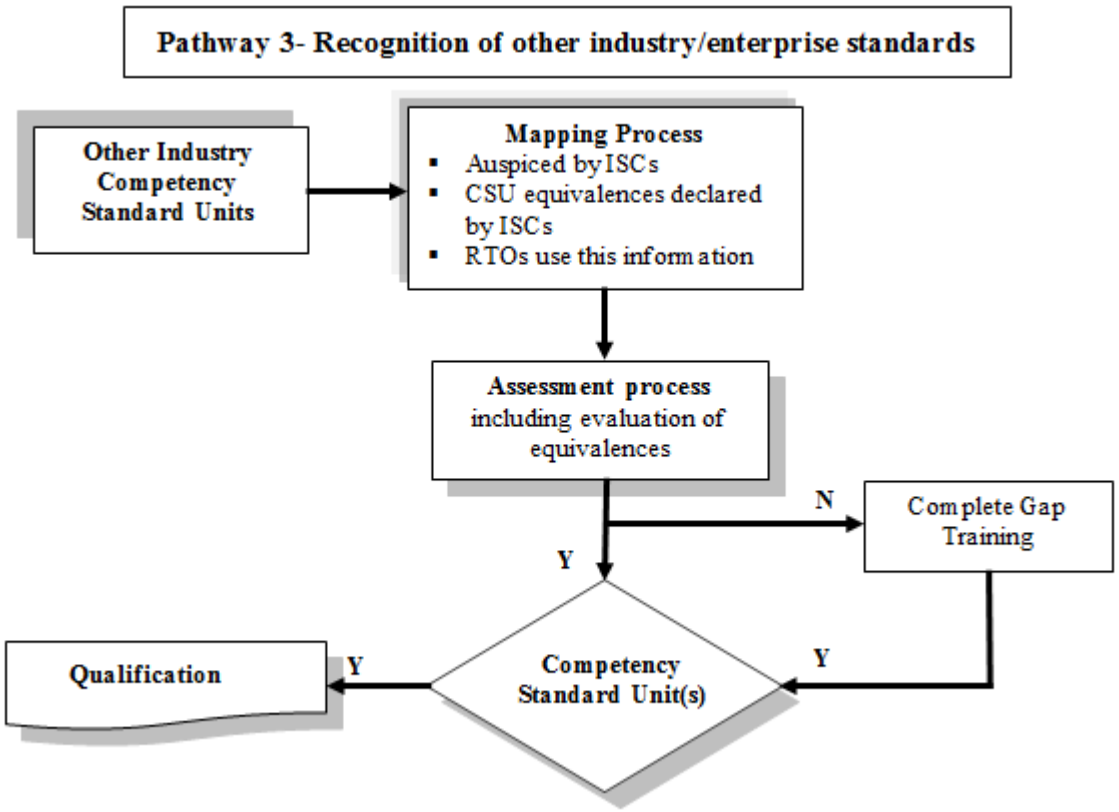
Pathway 3: Recognition of Other Industry/Enterprise Standards

This pathway is for individuals who have developed skills based on other nationally recognised industry or enterprise competency standards and who have received formal recognition in competency standard unit(s) from these areas. Recognition of equivalence of competency standard units between industries is through an agreed and formal mapping process. Equivalence of outcomes is declared by Industry Skills Councils for the relevant Training Packages. The recognition of units, as part of any mapping arrangements is the responsibility of the parties maintaining those competency standards. RTOs should investigate whether any mapping agreements are in place by contacting the relevant Industry Skills Councils.

Evidence of Competency

The applicant is required to supply details of the unit(s) held, their currency, and the unit(s) sought. This includes submitting any assessment reports to the RTO for a determination. This evidence will be reviewed against the mapping advice obtained by the RTO (or their nominee) and a judgement made. The result will be that the applicant is deemed competent for the unit(s) and a Statement of Attainment issued, or gaps are identified, advised and noted. Where a gap has been identified the applicant can consider the judgement and either pursue gap training or appeal the decision. Evidence used in the appeal process is based on the individual's records of achievement relative to the competency standard units for which recognition is sought.



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Learning and Assessment Pathways

New Entrants

Usually, learning and assessment are integrated, with assessment evidence being collected and feedback provided to the candidate at any time throughout the learning and assessment process.

Learning and assessment pathways may include structured programs in a variety of contexts using a range of strategies to meet different learner needs. Structured learning and assessment programs could be group-based, work-based, project-based, self-paced, action learning-based; conducted by distance or e-learning; and/or involve practice and experience in the workplace.

Learning and assessment pathways to suit Australian Apprenticeships have a mix of formal training and structured workplace experience with formative assessment activities through which candidates can acquire and demonstrate skills and knowledge from the relevant units of competency.

The pathway must take into account:

- irregular work activity
- work availability as it effects access to the range of activities required to be covered
- structured formative assessment activities which demonstrate to the candidate and assessor the current strengths and weaknesses of the candidate
- summative assessments for the purpose of deeming competence

The model that best accommodates a new entrant with no prior experience is one that recognises that learning is best facilitated in a structured educational program with directed workplace activities followed by recurring practice of these activities. That is, the model is based on a combination of on-the-job and off-the-job learning experiences aligned to competency standard unit requirements. It recognises that learning occurs in an active way and should involve appropriate learning strategies. The model provides coherence and integration between respective components. It also represents a:

- most effective and efficient means of effecting quality education and training
- means of assessing if learning has occurred and competence has been attained.

Competency standard units are specifications of work performance but they do not specify how training or assessment activities are to be carried out. Given the nature of the information contained within the competency standard units (content and its interrelationships) there is the potential for a variety of interpretations to occur when RTOs are designing training programs. To improve opportunities for consistency in interpretation the industry preferred approach is to support the use of appropriate learning and assessment strategies. To this end it has developed a Guideline Training and Assessment Model detailing the preferred approach. A copy of the model is available from E-Oz Energy Skills Australia.

Credit Pathways

Credit is the value assigned for the recognition of equivalence in content between different types of learning and/or qualifications which reduces the volume of learning required to achieve a qualification.

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Credit arrangements must be offered by all RTOs that offer Training Package qualifications. Each RTO must have a systematic institutional approach with clear, accessible and transparent policies and procedures.
Competencies already held by individuals can be formally assessed against the competency standard units in this Training Package and should be recognised regardless of how, when or where they were achieved.

Recognition of Prior Learning

Recognition of Prior Learning (RPL) is an assessment process which determines the credit outcomes of an individual application for credit.

The availability of Recognition of Prior Learning (RPL) provides all potential learners with access to credit opportunities.
The recognition of prior learning pathway is appropriate for candidates who have previously attained skills and knowledge and who, when enrolling in qualifications, seek to shorten the duration of their training and either continue or commence working. This may include the following groups of people:

- existing workers;
- individuals with overseas qualifications;
- recent migrants with established work histories;
- people returning to the workplace; and
- people with disabilities or injuries requiring a change in career.

As with all assessment, RPL assessment should be undertaken by academic or teaching staff with expertise in the subject, content of skills area, as well as knowledge of and expertise in RPL assessment policies and procedures.

Assessment methods used for RPL should provide a range of ways for individuals to demonstrate that they have met the required outcomes and can be granted credit. These might include:

- questioning (oral or written)
- consideration of a portfolio and review of contents
- consideration of third party reports and/or other documentation such as documentation such as articles, reports, project material, papers, testimonials or other products prepared by the RPL applicant that relate to the learning outcomes of the relevant qualification component
- mapping of learning outcomes from prior formal or non-formal learning to the relevant qualification components
- observation of performance, and
- participation in structured assessment activities the individual would normally be required to undertake if they were enrolled in the qualification component/s.

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In a Recognition of Prior Learning (RPL) pathway, the candidate provides current, quality evidence of their competency against the relevant unit of competency. This process may be directed by the candidate and verified by the assessor. Where the outcomes of this process indicate that the candidate is competent, structured training is not required. The RPL requirements of the AQTF or NVR must be met.
As with all assessment, the assessor must be confident that the evidence indicates that the candidate is currently competent against the endorsed unit of competency. This evidence may take a variety of forms and might include certification, references from past employers, testimonials from clients, work samples and/or observation of the candidate. The onus is on candidates to provide sufficient evidence to satisfy assessors that they currently hold the relevant competencies. In judging evidence, the assessor must ensure that the evidence of prior learning is:

- authentic (the candidate's own work);
- valid (directly related to the current version of the relevant endorsed unit of competency);
- reliable (shows that the candidate consistently meets the endorsed unit of competency);
- current (reflects the candidate's current capacity to perform the aspect of the work covered by the endorsed unit of competency); and
- sufficient (covers the full range of elements in the relevant unit of competency and addresses the four dimensions of competency, namely task skills, task management skills, contingency management skills, and job/role environment skills).

Credit Transfer
Credit transfer is a process which provides learners with agreed and consistent credit outcomes based on equivalences in content between matched qualifications.

This process involves education institutions:
mapping, comparing and evaluating the extent to which the defined learning outcomes and assessment requirements of the individual components of one qualification are equivalent to the learning outcomes and assessment requirements of the individual components of another qualification
making an educational judgment of the credit outcomes to be assigned between the matched components of the two qualifications setting out the agreed credit outcomes in a documented arrangement or agreement, and publicising the arrangement/agreement and credit available.

Assessment-only Pathway or Recognition of Prior Learning Pathway
In some circumstances an assessment-only (skills recognition) pathway will be warranted. The candidate provides current, quality evidence against the relevant unit of competency.
In an assessment-only or Recognition of Prior Learning (RPL) pathway, the candidate provides current, quality evidence of their competency. This process may be directed by the candidate and verified by the assessor, such as in the compilation of portfolios; or directed by the assessor, such as through observation of workplace performance and skills application, and oral and/or written assessment. Where the outcomes of this process indicate that the candidate is competent, structured training is not required. The RPL requirements of the AQTF or NVR must be met.

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As with all assessment, the assessor must be confident that the evidence indicates that the candidate is currently competent against the endorsed competency standard unit(s). This evidence may take a variety of forms and might include certification, Industry Skills Council equivalence mapping declarations, references from past employers, testimonials from clients and work samples. The onus is on candidates to provide sufficient evidence to satisfy assessors that they currently hold the relevant competencies. In judging evidence, the assessor must ensure that the evidence is:

- authentic (the candidate's own work)
- valid (directly related to the current version of the relevant endorsed Competency Standard Unit)
- reliable (a range of test instruments will provide the same result for a given candidate)
- current (reflect the candidate's current capacity to perform the aspect of the work covered by the endorsed competency standard unit), and
- sufficient (covers the full range of Elements and Performance Criteria in the relevant competency standard unit and addresses the four dimensions of competency, namely task skills, task management skills, con tangency management skills, and job/role environment skills).

An assessment-only or recognition of prior learning pathway is likely to be most appropriate for:

- candidates participating/enrolling in qualifications who want recognition for prior learning of current competencies
- existing workers
- individuals with overseas qualifications
- recent migrants with established work histories
- people returning to the workplace
- people with disabilities or injuries requiring a change in career
- people with existing competencies from allied industry Training Packages.

Note: The pathways listed above are only suggested and should not be used to limit a greater range of candidates seeking assessment.

Combination of 'Training and Assessment' and 'Assessment-only' Pathways

Credit may be awarded on the basis of a combination of credit transfer plus an individual RPL assessment for additional learning. Once credit has been awarded on the basis of RPL, subsequent credit transfer based on these learning outcomes should not include revisiting the RPL assessment but should be based on credit transfer or articulation or other arrangements between providers.

Where candidates for assessment have gained competencies through work and life experience and gaps in their competence are identified, or where they require training in new areas, a combination of approaches may be appropriate.

In such situations, the candidate may undertake an initial assessment to determine their current competence. Once current competence is identified, a structured training and assessment program ensures that the candidate acquires the required additional competencies identified as gaps. These would be achieved through a 'training and assessment pathway'.

1.3.04 Assessment Principles within the Electrotechnology Industry

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3.4 Assessment Principles within the Electrotechnology Industry

Assessment Judgements

Attributing Competency

The deeming of competency shall be based on evidence that is sufficient, valid, current and authentic, so that a quality, low risk judgment can be made based on these assessment guidelines.

Competencies shall be deemed on evidence showing that the person is able to undertake the responsibilities for all safety measures, care of technology, plant and equipment, use of standards, manuals and procedures, and care of the environment, directly related to the work function for which such competencies are required.

Note:

1. Where the consequences of incorrectly deeming a person competent carries a risk of injury to persons, commerce, or damage to property and/or the environment, the level of evidence required for sufficiency is higher than where there is little risk. The risk of attributing competence to an individual should, therefore, form a critical part of the assessment process and methodology. All prerequisites and/or co-requisites must have been achieved.
2. The decision to attribute competence differs from training effort and delivery. The decision to attribute competence is based on evidence being present for an assessor to properly make that decision, including the perquisite conditions. Learners can undertake training in competency standard units even when they may not have acquired any of the prerequisite competency standard units. The learners cannot be attributed any competency standard unit until they have acquired the prerequisites and met all of the conditions of the unit.
3. For more detailed information refer to Section 3.9 Guide to Assessment Methods and Items.

Principles of Assessment

All assessments carried out by RTOs are required to demonstrate compliance with the principles of assessment:

- Validity
- Reliability
- Flexibility
- Fairness
- Sufficiency

These principles must be addressed in the:

- design, establishment and management of the assessment system for this Training Package
- development of assessment tools, and
- the conduct of assessment.

Validity

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Assessment is valid when the process is sound and assesses what it claims to assess. Validity requires that:

a) assessment against the units of competency must cover the broad range of skills and knowledge that are essential to competent performance
b) assessment of knowledge and skills must be integrated with their practical application
c) judgement of competence must be based on sufficient evidence (that is, evidence gathered on a number of occasions and in a range of contexts using different assessment methods). The specific evidence requirements of each unit of competency provide advice on sufficiency

Reliability
Reliability refers to the degree to which evidence presented for assessment is consistently interpreted and results in consistent assessment outcomes. Reliability requires the assessor to have the required competencies in assessment and relevant vocational competencies (or to assess in conjunction with someone who has the vocational competencies). It can only be achieved when assessors share a common interpretation of the assessment requirements of the unit(s) being assessed.

Flexibility
To be flexible, assessment should reflect the candidate's needs; provide for recognition of competencies no matter how, where or when they have been acquired; draw on a range of methods appropriate to the context, competency and the candidate; and support continuous competency development.

Fairness
Fairness in assessment requires consideration of the individual candidate's needs and characteristics, and any reasonable adjustments that need to be applied to take account of them. It requires clear communication between the assessor and the candidate to ensure that the candidate is fully informed about, understands and is able to participate in, the assessment process, and agrees that the process is appropriate. It also includes an opportunity for the person being assessed to challenge the result of the assessment and to be reassessed if necessary.

Sufficiency
Sufficiency relates to the quality and quantity of evidence assessed. It requires collection of enough appropriate evidence to ensure that all aspects of competency have been satisfied and that competency can be demonstrated repeatedly. Supplementary sources of evidence may be necessary. The specific evidence requirements of each unit of competency provide advice on sufficiency. Sufficiency is also one of the rules of evidence.

Current
In assessment, currency relates to the age of the evidence presented by a candidate to demonstrate that they are still competent. Competency requires demonstration of current performance, so the evidence collected must be from either the present or the very recent past. The principle to be applied in the Electrotechnology Industry when determining currency of evidence is that claims are to be fully substantiated through both direct and indirect assessment processes.
Assessment processes ensure the candidate is current in terms of knowledge of the technology and/or processes and in the recency of application of the knowledge and skills.

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Regulatory Context of Assessment
The determination of competency is to be based on evidence of having consistently performed autonomously and to requirements across a representative range of specified equipment, processes and activities for the scope of work and/or endorsement for which competency is being sought. Evidence from a number of sources is acceptable, including formal assessment. With respect to the essential knowledge and associated skills (EKAS) component of each competency standard unit, assessment activities shall be in accordance with the approach required by the regulatory environment. This may include the use of industry supported essential knowledge and associated skills knowledge and skills specifications intended to ensure the depth and breadth of learning results in appropriate retention of the skills and knowledge and to enhance transferability.
Percentile-based graded assessment and reporting may be required by some jurisdictions in the regulatory environment. Where this is a requirement it will apply to the EKAS component and not the competency standard unit as a whole. RTOs should ensure that assessment is consistent with licensing/registration requirements. The latest information on licensing/registration requirements may be obtained by contacting the relevant Regulator or visiting the Electrical Regulatory Authorities Council (ERAC) website
http://www.erac.gov.au/
It is preferred that assessing competency occurs in the workplace; however it can be undertaken in a simulated work environment approved for that purpose.

Rules of Evidence
The rules of evidence guide the collection of evidence that address the principles of validity and reliability, guiding the collection of evidence to ensure that it is valid, sufficient, current and authentic.

Valid
Valid evidence must relate directly to the requirements of the unit of competency. In ensuring evidence is valid, assessors must ensure that the evidence collected supports demonstration of the outcomes and performance requirements of the unit of competency together with the knowledge and skills necessary for competent performance. Valid evidence must encapsulate the breadth and depth of the unit of competency, which will necessitate using a number of different assessment methods.

Sufficient
Sufficiency relates to the quality and quantity of evidence assessed. It requires collection of enough appropriate evidence to ensure that all aspects of competency have been satisfied and that competency can be demonstrated repeatedly. Supplementary sources of evidence may be necessary. The specific evidence requirements of each unit of competency provide advice on sufficiency.

Sufficiency of Evidence
In all instances competency is to be attributed on evidence sufficient to show that a person has the necessary skills required for the scope of work. These include:
Task skills – performing individual tasks
Task management skills – managing a number of different tasks
Contingency management skills – responding to irregularities and breakdowns in routines

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Job/role environment skills – dealing with the responsibilities and expectations of the work environment including working with others.
Evidence must demonstrate that an individual can perform competently across the specified range of activities and has the essential knowledge, understanding and associated skills underpinning the competency.

Current
In assessment, currency relates to the age of the evidence presented by a candidate to demonstrate that they are still competent. Competency requires demonstration of current performance, so the evidence collected must be from either the present or the very recent past.
Currency of Evidence
Evidence must be relevant to what is outlined in current competency standard units.

Note: The deeming of competence at a point in time does not mean that competence exists for all time; competency must be maintained by use and/or retraining. Refer also to Section 3.9 'Guide to Assessment Methods and Items' for more detailed information on currency.

Recent changes in technology are unlikely to be properly supported by evidence pre-dating the changes. Similarly, if the individual claiming competency has not performed/applied the competency for extensive periods of time, documentary evidence would not be sufficient.

Authentic
To accept evidence as authentic, an assessor must be assured that the evidence presented for assessment is the candidate's own work
Authenticity
Evidence is to be genuine and related to the person being assessed and no one else.
By way of supporting and reinforcing both the concept of competency and the competency standard units as the currency for Vocational Education **and** Training (VET) system, the Electrotechnology Industry embraces the following:

- Assessment (summative or final) is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment.
- Simulation must be in accord with any prevailing industry policy. It is recognised that in some circumstances, assessment may occur outside the workplace; however this should only occur where necessary and must be in accord with industry and regulatory policy. In relation to this Training Package the Industry Skills Council for ElectroComms and EnergyUtilities, E-Oz Energy Skills Australia, has developed an Industry Simulation Policy. This can be accessed from the E-Oz Energy Skills Australia website at: www.e-oz.com.au.
- All **persons** may claim formal recognition for an assessment of an individual competency standard unit or a group of units.
- All **persons** have the right to have relevant competencies recognised through the most expeditious assessment system and method.
- Under-**represented** groups are not biased from participation and access.

Assessment Requirements of the Australian Quality Training Framework

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Assessment leading to nationally recognised AQF qualifications and Statements of Attainment in the vocational education and training sector must meet the requirements of the AQTF or NVR as expressed in the AQTF 2010 Essential Standards for Registration or Standards for NVR Registered Training Organisations 2012.
The AQTF 2010 Essential Standards for Initial and Continuing Registration can be downloaded from <www.training.com.au>.
The Standards for NVR Registered Training Organisations 2012 can be downloaded from <http://www.comlaw.gov.au/Details/F2013L00167>

The following points summarise the assessment requirements.

Registration of Training Organisations

Assessment must be conducted by or on behalf of a Registered Training Organisation (RTO) formally registered by a State/Territory registering/course accrediting body in accordance with the AQTF or the Standards for NVR Registered Training Organisations 2012. The RTO must have the specific competency standard units and/or AQF qualifications on its scope of registration.
The RTO is responsible for all aspects of assessment. The assessment must cover the critical aspects of evidence (assessment) detailed in each unit. In addressing these critical aspects, and maintaining reasonable consistency, the assessment is to ensure that:

- the individual satisfies the requirements in terms of underpinning/essential knowledge and associated skills so that their ability to transfer the competency to differing circumstances may reasonably be inferred
- the individual is competent to safely perform all the practical applications required.

The RTO is also responsible for issuing formal recognition in the form of National Qualifications or Statements of Attainment and, where regulatory requirements apply, providing the required additional information, and, where applicable and preferred by industry, entering relevant information into an individual *Industry Skills Passport* or other industry approved instrument. In discharging these responsibilities the RTO will:

- issue the National Qualification based on individuals having been assessed as competent for the qualification and all the competency standard units which constitute the qualification, **and/or**
- issue formal recognition (Statements of Attainment) in respect of individual or sets of competency standard units for which candidates have been assessed and found competent, **and/or**
- where required for regulated or industry purposes, issue additional formal information as specified by the industry and relevant regulator.

Consistent with the criteria established by State Training Authorities, RTOs are responsible for the implementation of the quality assurance arrangements included in these guidelines.
Quality Training and Assessment
Each RTO must provide quality training and assessment across all its operations. See the AQTF 2010 Essential Standards for Initial and Continuing Registration, Standard 1 or Standards for NVR Registered Training Organisations 2012.
Assessor Competency Requirements

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Each person involved in training and assessment must be competent for the functions they perform. See the AQTF 2010 Essential Standards for Initial and Continuing Registration, Standard 1 for assessor (and trainer) competency requirements. See also the AQTF 2010 Users' Guide to the Essential Standards for Registration – Appendix 2 or Standards for NVR Registered Training Organisations 2012.

Assessment Requirements

The RTO assessments, including RPL, must meet the requirements of the relevant endorsed Training Package. See the AQTF 2010 *Essential Standards for Initial and Continuing Registration.* or *Standards for NVR Registered Training Organisations 2012*

Assessment Strategies

Each RTO must have strategies for training and assessment that meet the requirements of the relevant Training Package or accredited course and are developed in consultation with industry stakeholders. See the AQTF 2010 *Essential Standards for Initial and Continuing Registration* or *Standards for NVR Registered Training Organisations 2012.*

National Recognition

Each RTO must recognise the AQF qualifications and Statements of Attainment issued by any other RTO. See the AQTF 2010 *Essential Standards for Initial and Continuing Registration* or *Standards for NVR Registered Training Organisations 2012,* RTOs may contact the E-Oz Energy Skills Australia as the declared National Industry Skills Council for the ElectroComms and EnergyUtilities Industry, for assistance with national recognition.

Access and Equity and Client Outcomes

Each RTO must adhere to the principles of access and equity and maximise outcomes for its clients. See AQTF 2010 *Essential Standards for Initial and Continuing Registration* or *Standards for NVR Registered Training Organisations 2012.*

Monitoring Assessments

Training and/or assessment provided on behalf of the RTO must be monitored to ensure that it is in accordance with all aspects of the AQTF 2010 Essential Standards for Initial and Continuing Registration or Standards for NVR Registered Training Organisations 2012

Recording Assessment Outcomes

Each RTO must manage records to ensure their accuracy and integrity. See the AQTF 2010 Essential Standards for Initial and Continuing Registration or Standards for NVR Registered Training Organisations 2012.

Partnership Arrangements

An RTO must have, and comply with, written agreements with each organisation providing training and/or assessment on its behalf.

RTOs operating in partnership with other organisations are responsible for the quality of the partnering organisation services and service outcomes. Under the AQTF or Standards for NVR Registered Training Organisations 2012, RTOs may enter into partnerships with external and/or non-registered third party organisations, such as schools, industry organisations and enterprises, for delivery and assessment within the RTOs scope of registration.

External and/or non-registered third party organisations do not have to be Registered Training Organisations; however, the agreement must specify how each party to the agreement will discharge its responsibilities for compliance with all aspects of the Standards for Registered Training Organisations.

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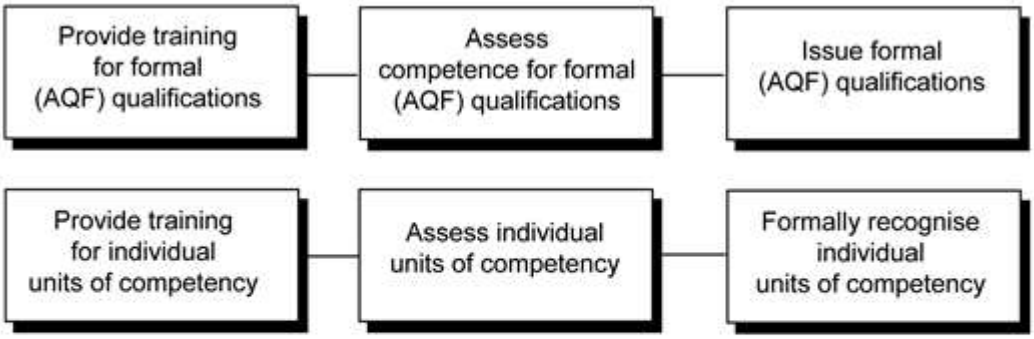
Roles for Registered Training Organisations

Training and assessment:



Assessment only:

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Where the RTO establishes a partnership arrangement it must have a formal agreement with the organisation that provides the training and/or assessment services. This agreement must specify how all parties will discharge their responsibilities for ensuring the quality of the training and/or assessment conducted on its behalf, including the qualification requirements of those to be involved in delivery and assessment. The RTO has full responsibility for the quality and outcomes of any training or assessment conducted on its behalf, and must maintain a register of all such agreements.

Issuing AQF Qualifications and Statements of Attainment

Each RTO must issue AQF qualifications and Statements of Attainment that meet the requirements of the AQF Implementation Handbook and the endorsed Training Packages within the scope of its registration. An AQF qualification is issued once the full requirements for a qualification, as specified in the nationally endorsed Training Package are met. A Statement of Attainment is issued where the individual has completed one or more units of competency from nationally recognised qualification(s)/course(s). See the AQTF and the current edition of the AQF Implementation Handbook - available on the AQFC website www.aqf.edu.au.

Licensing/Registration Requirements

This section provides information on licensing/registration requirements for this Training Package, with the following important disclaimer.

Licensing and registration requirements that apply to specific industries, and vocational education and training, vary between each State and Territory, and can regularly change. The developers of this Training Package consider that the licensing/registration requirements described in this section apply to RTOs, assessors or candidates with respect to this Training Package. While reasonable care has been taken in its preparation, the developers of this Training Package and the Department cannot guarantee that the list is definitive or accurate at the time of reading; the information in this section is provided in good faith on that basis.

Statutory/Regulatory requirements may apply at the qualification, Skill Set or individual unit level. Where a component has a regulatory requirement it is identified in the following sections:

- Competency Standard – Unit Descriptor 1.2) License to practice
- Identified Skill Set – Target Group
- Qualification – Scope

Contact the relevant State or Territory Department(s) to check if the licensing/registration requirements described below still apply, and to check if there are any others with which you must comply. For further information contact:

Current information on national and jurisdictional licensing requirements can be obtained from:
http://www.licensinglinenews.com/ or the relevant authority in their jurisdiction

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State Electrical Regulatory Bodies		
Jurisdiction	**Organisation**	**Website**
Australian Capital Territory	ACT Planning and Land Authority	www.actpla.act.gov.au
New South Wales	Office of Fair Trading	www.fairtrading.nsw.gov.au
Northern Territory	Electrical Workers and Contractors Licensing Board	www.electricallicensing.nt.gov.au
Queensland	Department of Employment and Industrial Relations	www.deir.qld.gov.au
South Australia	Office of Consumer and Business Affairs	www.ocba.sa.gov.au
Tasmania	Workplace Standards Tasmania	www.wst.tas.gov.au
Victoria	Energy Safe Victoria	www.esv.vic.gov.au
Western Australia	Department of Consumer and Employment Protection	www.energysafety.wa.gov.au

Statutory Authorities		
Jurisdiction	**Organisation**	**Website**
Australia	australia.gov.au	www.australia.gov.au/306
Australian Capital Territory	ACT Legislation Register	www.legislation.act.gov.au
New South Wales	Parliamentary Counsel's Office	www.legislation.nsw.gov.au
Northern Territory	Department of the Chief Minister	www.nt.gov.au/dcm/legislation/current.html
Queensland	Office of the Queensland Parliamentary Counsel	www.legislation.qld.gov.au/oqpchome.htm
South Australia	Parliament of South Australia	www.legislation.sa.gov.au
Tasmania	Tasmanian Legislation	www.thelaw.tas.gov.au/index.w3p

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Victoria	Victorian Legislation and Parliamentary Documents	www.legislation.vic.gov.au
Western Australia	State Law Publisher	www.slp.wa.gov.au

Requirements for Assessors

In order to conduct assessment for statutory licensing or other industry registration requirements, assessors must meet the requirements established by regulatory agencies and respective nominees, in addition to the AQTF or NVR requirements. Assessors are to liaise with relevant agencies to ensure all requirements are met.

Where regulatory requirements are stated in the relevant sections of a Qualification, Unit or Skill Set, trainers and assessors shall have a current, equivalent licence, registration or permit to work for the jurisdiction in which the training and/or assessment takes place.

Please refer to the bodies listed above for details of jurisdictional regulatory requirements.

Requirements for RTOs

Selected competency standard units and qualifications in this Training Package provide the basis for a range of statutory licensing and industry registration arrangements. To satisfy these licensing and registration arrangements, RTOs are to keep abreast of developments and any additional requirements detailed by those bodies and their nominees. RTOs and their assessors are therefore required to liaise with the Training Package developer and relevant agencies to ensure requirements are known and met.

Requirements for Candidates

Individuals being assessed under statutory licensing and industry registration systems may be required to comply with training and experience requirements additional to any minimum requirements identified in this Training Package. RTOs are to formally advise individuals of these additional requirements prior to the delivery of the Training Package outcomes.

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1.3.05 Assessment Processes in the Electrotechnology Industry

3.5 Assessment Processes in the Electrotechnology Industry

Within the Electrotechnology Industry **sampling**, **profiling** and **portfolio** are recognised as the three main methods of collecting evidence to assist the assessment processes and, while they are not mandatory, they have become accepted and the preferred industry practice. These guidelines do not provide an extensive technical description of each of these methods; however, it is important to recognise the impact each will have on the management of assessment practices. An overview of each is provided below along with sample templates to assist RTOs in planning, managing and administering training and assessment delivery.

1. Sampling

Sampling requires that evidence of competence be derived from a sample of performances. Application skills are normally assessed by practical measures and knowledge underpinning performance is typically assessed in learning environments such as classrooms, by conventional written or oral questioning.

2. Profiling

Profiling requires the progressive recording of many samples through structured documentation. Progressive monitoring of evidence over an extended period of time is used to guide future experience and making judgements about the developing competency profile of the candidate/learner. The focus of evidence collection is set against the Elements, Range Statement and critical aspects detailed in the competency standard units and are further refined by the level of supervision experienced. The evidence collection process is staged against known and pre-defined work performance outcomes as specified in the competency standard units.

Profiling will assist in obtaining a series of periodical audit assessments and/or a final holistic assessment event when necessary. Technical educational achievements may be incorporated in the profiling model to augment information gathered directly from the workplace. Profiling using an ElectroComms and Energy Utilities ISC approved system is the industry model for the collection of workplace performance evidence for those undertaking licenced qualifications.

3. Portfolio

The Portfolio approach is best suited to assessment conducted as Recognition of Prior Learning (RPL) and is to be in accord with the current AQTF Standards or Standards for NVR Registered Training Organisations 2012 for RTOs or its replacement/equivalent. It requires the collection or build-up of indirect evidence as to an individual's competence.

The portfolio of evidence could include Statements of Attainment issued by other RTOs (Mutual Recognition AQTF Standard or Standards for NVR Registered Training Organisations 2012), suitably focused references and testimonials, formal project appraisals, work records and any other evidence which is current and relevant to the competencies sought.

Opportunities for Combined Approaches

The assessment approaches/processes described above may be implemented in combination. The assessment process selected will be acceptable to the industry if:

- the outcome is valid
- the approach supports industry-wide consistency

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- the requirements of the competency standard units are satisfied in accordance with the industry expectations
- costs are acceptable to the industry.

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1.3.06 Assessor Requirements

3.6 Assessor Requirements

This section identifies the specific requirements on the vocational competence and experience for assessors, to ensure that they meet the needs of industry and their obligations under AQTF or NVR, and clarifies how others may contribute to the assessment process where one person alone does not hold all the required competencies.

In such situations, the trainer/assessor candidate may undertake an initial assessment to determine their current competency. Once current competency is identified, a structured learning and assessment program ensures that the candidate acquires the required additional competencies identified as gaps.

The integrity of the Electrotechnology Industry assessment processes is centred on the need for all assessments to be conducted under the direction or the authority of an RTO using qualified assessors who may function with or within the RTO.

The responsibility for some activities may be delegated. For example, in a long term profiling process the qualified assessor may establish the system and identify the evidence to be captured by an industry approved system. Although the evidence is gathered by others the assessor will examine the evidence and make judgments.

Whatever forms of evidence and evidence gathering are used the RTO has full responsibility for the judgements in deeming competence.

Assessor Competencies

The AQTF and NVR specifies mandatory competency requirements for assessors. For information, Element 1.4 from the AQTF 2007 Essential Standards for Registration and 4.4, 15.4 Standards for NVR Registered Training Organisations 2012 follows:

Training and assessment are conducted by trainers and assessors who:

a) have the necessary training and assessment competencies as determined by the National Quality Council or its successors, and

b) have the relevant vocational competencies at least to the level being delivered or assessed, and

c) can demonstrate current industry skills directly relevant to the training/assessment being undertaken, and

d) continue to develop their Vocational Education and Training (VET) knowledge and skills as well as their industry currency and trainer/assessor competence.

In this Training Package, assessments against the competencies will be carried out in accordance with the endorsed guidelines. The guidelines include the necessary qualifications for those conducting assessments and provide for those situations where more than one person may contribute to the assessment as occurs when the required technical and assessment competencies are not held by any one person.

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Assessors are to be competent in the competencies which they are to assess or are to be assisted by an appropriate subject matter expert who is currently competent in the unit being assessed This includes language literacy and numeracy (LLN), cultural diversity and under-represented groups, environmental and industrial safety and occupational health and safety (OHS).
Assessors (and their subject matter expert) must know current industry practices for the job or the role against which the performance is being assessed, and must practise the necessary interpersonal skills required in the assessment process.
All persons required to plan, assess, develop or validate assessment related matters must be currently competent against the competency standard(s) contained in the Training and Assessment Training Package, and comply with the AQTF Standards for RTOs or Standards for NVR Registered Training Organisations 2012 and comply with the relevant industry vocational competencies.

Using Qualified Assessors

All assessment is to be under the authority of a formally qualified assessor. Within this constraint, the RTO may employ any or all of the following:

- a workplace assessor who is currently competent against the assessor competency standards contained within the Training and Assessment Training Package and the relevant industry vocational competencies.
- a workplace assessor who is currently competent against the assessor competency standards contained within the Training and Assessment Training Package and who has ready access to another person who is competent in, and can advise the assessor on the relevant vocational competencies to at least the level being assessed.
- an assessment panel that includes at least one person who is currently competent against the assessor competency standards contained within the Training and Assessment Training Package as well as at least one person who is competent in the relevant vocational competencies to at least the level being assessed.
- an external assessor who is currently competent against the assessor standards contained within the Training and Assessment Training Package but with the assessment evidence being collected, by a workplace supervisor who has the relevant vocational competencies to at least the level being assessed and is using industry endorsed assessment procedures.
- a workplace supervisor, with the relevant vocational competencies to at least the level being assessed, who uses industry endorsed assessment procedures with the outcome being validated by an externally qualified assessor who is currently competent against the assessor standards contained within the Training and Assessment Training Package.

In relation to the new entrant pathway industry would expect that in all instances the RTO will retain the responsibility of managing the competency development training program and related plan, the ultimate attributing of competence against competency standard units using qualified assessors, and the issuing of qualifications, and/or Statements of Attainment. It will also include providing any additional information that may be required for licensing requirements and specified by regulators or industry.
The process should be undertaken in accordance with the recognition processes defined by relevant training authorities.

Assessor Competencies

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The AQTF and NVR specifies mandatory competency requirements for assessors. For information, see the AQTF *Essential Standards for Initial and Continuing Registration.* follows:
"1.4 Training and assessments is delivered by trainers and assessors who:

a) *have the necessary training and assessment competencies as determined by the National Quality Council or its successors*
b) *have the relevant vocational competencies at least to the level being delivered or assessed and*
c) *can demonstrate current industry skills directly relevant to the training/assessment being undertaken, and*
d) *continue developing their Vocational Education and Training knowledge and skills as well as their industry currency and trainers/assessor competence."*

The Determination of the National Quality Council 18 December 2009 regarding Training and Assessment competencies to be held by Trainers and Assessors appendix 3 to the AQTF *User Guide for Initial Registration* specifies mandatory competency requirements for Trainers and Assessors:

Trainers must:

i) hold the Certificate IV in Training and Assessment (TAE40110) from the Training and Assessment Training Package; or

ii) be able to demonstrate equivalent competencies; or

iii) hold the Certificate IV in Assessment and Workplace Training from the superseded Training Package for Assessment and Workplace Training (BSZ98), or

iv) be able to demonstrate that prior to 23 November 2005 they had been assessed as holding equivalent competencies to the Certificate IV in Assessment and Workplace Training from the Training Package for Assessment and Workplace Training (BSZ98); or

v) work under the direct supervision* of a person who has the competencies specified in (i) or (ii) or (iii) or (iv) above; and

be able to demonstrate vocational competencies at least to the level of those being delivered.

Note: Direct supervision is achieved when a person delivering training on behalf of the RTO has regular guidance, support and direction from a person designated by the RTO who has the trainer competencies in (i), (ii), (iii) or (iv) above and who monitors and is accountable for the training delivery. It is not necessary for

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the supervising person to be present during all training delivery.

All assessors who are engaged in assessing against this Training Package must be engaged by an RTO, or be acting under the registration of an RTO (for example, an assessor working in an enterprise, or as a consultant, that has a partnership arrangement with the RTO).

Assessors must:

i) hold the following three competencies from the Training and Assessment Training Package (TAE10):

(a) TAEASS401B - Plan assessment activities and processes

(b) TAEASS402B - Assess competence

(c) TAEASS403B - Participate in assessment validation; or

ii) be able to demonstrate equivalent competencies to all three units of competency listed in (i); or

iii) hold the following competencies from the superseded Training Package for Assessment and

Workplace Training (BSZ98):

BSZ401A Plan assessment,

BSZ402A Conduct assessment, and

BSZ403A Review assessment; or

iv) be able to demonstrate that prior to 23 November 2005 they had been assessed as holding equivalent competencies to all three units of competency listed in (iii) above.

Note: If a person does not have the assessment competencies as defined in (i) (ii), (iii) or (iv) above and the relevant vocational competencies at least to the level being assessed, one person with all the assessment competencies listed in (i) (ii), (iii) or (iv) above and one or more persons who have the relevant vocational competencies at least to the level being assessed may work together to conduct the assessments.

Vocational competency

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Vocational competency is defined as broad industry knowledge and experience, usually combined with a relevant industry qualification. A person who has vocational competency will be familiar with the content of the vocation and will have relevant current experience in the industry. Vocational competency must be considered on an industry-by-industry basis and with reference to the guidance provided in the Assessment Guidelines of the relevant Training Package.
Training Packages include advice specific to the industry related to the vocational competencies of assessors. This may include advice on relevant industry qualifications and experience required for assessing against the Training Package or for specific qualifications within the package. The Training Package will also provide specific industry advice outlining what it sees as acceptable forms of evidence to demonstrate the maintenance of currency of vocational competency.

This Training Package provides a range of options for meeting these assessor requirements. Assessments can be undertaken in a variety of workplace and enterprise contexts by individual assessors; partnerships involving assessors and technical experts; and teams of assessors.
The options below show how the requirement to use qualified assessors can be met.

Assessors, Technical Experts and Workplace Supervisors

Single assessor – Single arrangement

Where an individual assessor conducts the assessment, the assessor is required to:

- hold formal recognition of competence in the relevant units in the Training Package for Training and Assessment
- be deemed competent and, where possible, hold formal recognition of competence in the specific competency standard units in this Training Package, at least to the level being assessed.

In addition, it is recommended by the industry that the assessor can:

- demonstrate current knowledge of the Electrotechnology Industry, industry practices, and the job or role against which performance is being assessed
- demonstrate current knowledge and skill in assessing against this Training Package in a range of contexts
- demonstrate the necessary interpersonal and communication skills required in the assessment process
- continue to meet the requirements of the industry
- ensure assessment is consistent with the Australian Quality Training Framework Standards for Registered Training Organisations or Standards for NVR Registered Training Organisations 2012
- promote confidence in the system and the assessment outcomes on the part of industry, employers, enterprises, unions, employees, trainees, assessors and trainers
- ensure assessment processes and outcomes are valid, reliable, fair and flexible
- support RTOs in effectively carrying out their responsibilities
- participate in professional development
- have relevant work experience
- participate in professional/industry networks and assessor programs

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- have recent planning and review of assessment activities
- participate in assessment validation processes
- have recent assessment and/or workplace training activities.

Partnership arrangements

Option 1 – Working with a Technical Expert

An assessor works with a technical expert to conduct the assessment. The assessor is required to hold formal recognition of competence in the relevant units in the Training Package for Training and Assessment.
In addition, it is recommended that the assessor is able to:

- demonstrate current knowledge and skill in assessing against this Training Package which contains the vocational standards for industry in a range of contexts
- demonstrate capability to assess with a technical expert
- demonstrate the interpersonal and communication skills required in the assessment process.

A technical expert is someone who is deemed currently competent and, where possible, holds formal recognition of competence in the specific competency standard units from this Training Package, at least to the level being assessed.
In addition, it is recommended that the technical expert is able to:

- demonstrate current knowledge of the industry, industry practices, and the job or role against which performance is being assessed
- communicate and liaise with the assessor throughout the assessment process.

Option 2 – Working with a Workplace Supervisor

An assessor works with workplace supervisor in collecting evidence for valid assessment.
An assessor is required to:

- hold formal recognition of competence in training and assessment in the relevant units in the Training and Assessment Training Package
- make the assessment decision.

In addition, it is recommended that the assessor is able to:

- demonstrate current knowledge and skill in assessing against this Training Package in a range of contexts
- demonstrate a capability to assess using a workplace supervisor as a valid and reliable source of evidence collaboration
- demonstrate interpersonal and communication skills required in the assessment process
- communicate and liaise, where appropriate, with the workplace supervisor throughout the assessment process.

A workplace supervisor is someone who is deemed currently competent and, where possible, holds formal recognition of competence in the specific competency standard units from this Training Package, at least to the level being assessed.
In addition, it is recommended that the workplace supervisor is able to:

- demonstrate current knowledge of the industry, industry practices, and the job or role against which performance is being assessed

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- communicate and liaise, where appropriate, with the assessor throughout the assessment process
- use agreed practices to gather and record evidence for the assessor to use in making a valid judgement on competency.

Team/Panel Assessment

The members of an assessment team/panel have assessment and industry experience and expertise and they work together to conduct the assessment. This involves collecting evidence and making judgements about competency. The members of the team must include at least one person who:

- holds formal recognition of competence in training and assessment in the relevant units in the Training and Assessment Training Package
- is deemed competent and, where possible, holds formal recognition of competence in the specific competency standard units under assessment, at least to the level being assessed; and if not technically competent uses team/panel members with current technical competence in requisite units.

In addition, it is recommended that members of the team/panel involved in the assessment are able to demonstrate:

- current knowledge of the industry, industry practices, and the job or role against which performance is being assessed
- current knowledge and skill in assessing against this Training Package in a range of contexts
- the interpersonal and communication skills required in the assessment process and to liaise with other team/panel members throughout the assessment process.

Assessments against the competencies in the Training Package will be carried out in accordance with these endorsed guidelines. The guidelines include the necessary qualifications for those conducting assessments and provide for those situations where more than one person may contribute to the assessment and where the required technical and assessment competencies may not be held by any one person.

1.3.07 Designing Assessment Tools

3.7 Designing Assessment Tools

This section provides an overview on the use and development of assessment tools.

Use of Assessment Tools

Assessment tools provide a means of collecting the evidence that assessors use in making judgements about whether candidates have achieved competency.

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There is no set format or process for the design, production or development of assessment tools. Assessors may use prepared assessment tools, such as those specifically developed to support this Training Package \-– Training and Assessment Advice Manual for the Electrotechnology Training Package, available from E-Oz Energy Skills Australia. Visit the website: (www.e-oz.com.au). Alternatively they may develop their own assessment materials to meet the needs of their clients by utilising pre-developed training and assessment instruments included in Section 3.8 Electrotechnology Industry Guidelines for designing assessment materials.

Using Prepared Assessment Tools

If using prepared assessment tools, assessors should ensure that these tools are benchmarked or mapped against the current version of the relevant competency standard unit(s) and any industry-preferred model, and supported by the industry. This can be done by checking that the materials are listed on training.gov.au or E-Oz Energy Skills Australia (www.e-oz.com.au). Materials on the list have been noted by the National Skills Standards Council (NSSC), as meeting the quality criteria for Training Packages support materials.

Developing Assessment Tools

When developing their own assessment tools, assessors must ensure that the tools:

- are benchmarked against the relevant unit or units of competency;
- are reviewed as part of the validation of assessment strategies required under the AQTF or NVR; and
- meet the assessment requirements expressed in the AQTF 2010 Essential Standards for Initial and Continuing Registration or Standards for NVR Registered Training Organisations 2012.

A key reference for assessors developing assessment tools is TAE10 Training and Education Training Package.

Language, Literacy and Numeracy

The design of assessment tools must reflect the language, literacy and numeracy competencies required for the performance of a task in the workplace and not exceed these expectations

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1.3.08 Assessment Methods

3.8 Assessment Methods

Assessment methods must be appropriate to the situation. Learners can be encouraged to use these methods for self-assessment. Combinations of these methods will be required for most situations, e.g. observations and oral questioning.
The recommended assessment methods for collecting evidence required to determine the candidate's competency are:

- oral questioning
- structured observation of work
- indirect supporting evidence (supervisor's reports)

It is recommended that assessors use open questions in conjunction with direct observations to assess the candidate's ability to:

- apply relevant knowledge to the particular task
- perform the required tasks safely and efficiently
- handle unforeseen contingencies and circumstances
- recognise and solve problems associated with the whole job (which may not necessarily occur during the assessment).

Supervisor's reports or verified calculations should be used to confirm that workplace job activities have been completed on time and meet the required specifications. This is particularly relevant when the assessor may not be present for the total duration of the workplace job activity and/or the learner/candidate works as part of a team.
For more information see Section 3.10 Guide to assessment methods and items.
Direct observation. Observe the learner carrying out their usual practical tasks in the workplace. This may be accompanied by questions. Direct observation is probably the easiest and most convenient method of assessment.
Third party reports. Information is provided by the immediate supervisor or other appropriate person(s). An external assessor may not have the opportunity to make multiple observations of a candidate over a period of time, unlike an internal (in-house) assessor. The external assessor may obtain third party reports to supplement an assessment.
Demonstration and questioning. If there is no opportunity to observe this competency in the standard work environment, the assessor may ask the candidate to provide a practical demonstration. The assessor can see both the process and the finished product.
Pen and paper tests and essays. These are used to measure the extent of knowledge and/or problem-solving capability. They can complement practical demonstration.
Oral tests. These can be an adjunct to practical demonstration and pen and paper tests.
Projects. These are usually unsupervised. The assessor uses the final product and supervisor reports as a basis for judgement.
Simulation. This may involve an off-site practical test. The actual tasks and conditions are similar to real life situations and are in accord with prevailing industry policy enunciated by the Industry Skills Council. A Simulation Policy has been developed and can be obtained at www.e-oz.com.
Portfolios. These are used for assessing skills achieved in the past. They can include work samples.

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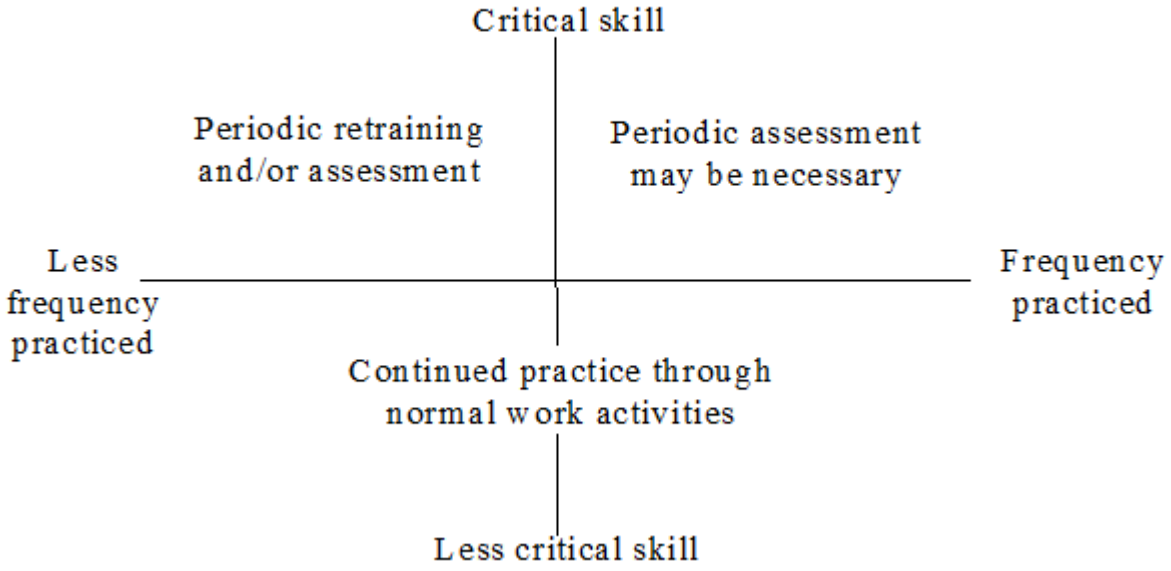
Profiling. Information is gathered over time from a structured profiled data entry card, log book or electronic system.

Selecting assessment methods is influenced by factors such as: the extent of the assessment, the most effective locations, access to physical resources and safety measures required. Sources of evidence need to be as comprehensive as possible in order to minimise error in judgment. Activities associated with normal everyday work contribute to the 'richness' of the evidence data.

When choosing an assessment method and developing assessment instruments, assessors must take into consideration that some knowledge and some skills are more critical to safety and operational requirements than others and some skills are practised more/less frequently. These considerations can be summarised as follows:

Skill criticality and frequency of practice



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Assessment methods and instruments used should satisfy the conditions associated with sufficiency, currency, authenticity, validity, reliability, and be holistic in nature.
The following *Table – Guide to Assessment Methods and Instruments* provides a summary of assessment methods in common use and the situations in which they may apply.

Table – Guide to Assessment Methods and Instruments

Assessment method	Appropriate instruments	Valid purposes or use	Conditions and numbers	Time constraints	Repeat assessments possible
Written objective tests	True/false Multiple choice Matching Completion	Confirming essential factual knowledge, principles Assessing deduction, transfer of knowledge Complementing other methods	Controlled classroom High level supervision Large numbers	Moderate	Many
Written responses, short and extended answers	Calculations Definitions, explanations Essays	Assessing use of information Application of knowledge General ideas and solutions Research, organization and expression of concepts or ideas	Test condition as above or Minimal supervision, and assistance	Moderate	Many
Oral test/ technical interview	Set question Scenarios	Assessing depth and breadth of knowledge Application of knowledge Relative to experience	Interview condition One to one	Moderate	Many
On job or workplace	Observation, checklist	Identifying mastery or	Normal working	High	Nil to many depending on

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Assessment method	Appropriate instruments	Valid purposes or use	Conditions and numbers	Time constraints	Repeat assessments possible
assessment	Product assessment Questioning to complement observations	competence of practical task, technical skill or interpersonal skill in real or simulated setting Identifying gaps in education and training	conditions Moderate level supervision One to one Avoid expensive or hazardous situations		assessment of product or process
Practical/ Exercises	Stimulated work exercises Structured practical exercises Fault finding exercises	Checking mastery or competence of a practical task, technical skill, or subset of performance in a simulated work setting	Controlled laboratory or field setting High level supervision	Low	Several
Practical projects	Research task or investigation Product or process development Individual learning contract	Assessing integration and application of a number of work related skills to solve a given problem Assessing individual approaches, innovation, creativity Assessing interaction with others	Access to laboratory, workshop or workplace Little supervision	Low	Several
Assignments	Resource life Case studied Poster presentation Reports of video or speaker	Confirming competence to research, analyse and synthesise information Assessment of application of	Moderate of level control Non-test conditions Little supervision	Low	Several

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Assessment method	**Appropriate instruments**	**Valid purposes or use**	**Conditions and numbers**	**Time constraints**	**Repeat assessments possible**
	presentations Reports of laboratory/field work, excursions Individual learning contracts Writing simple manuals or procedures	knowledge, skills and attitudes where practical testing is not feasible Assessment of communication skills			
Personal appraisal	Checklists or criteria which enable peer or self assessment	Establishing readiness for summative assessments Assessment of an individual's performance within a team effort	Non-test conditions Little supervision Small numbers	Low	Many
Verbal assessment	Oral exposition or lecture Seminar, presentation and group discussion Oral/aural tests Interviews	Confirming understanding of principles underpinning performance Supplement to other assessment methods Verification of learner's submitted work.	Moderate level of control High level of supervision One to one	Low	Several
Profiling[1]	Structured manual or computer-based log.	Tracks competency development against the industry standard profile specified by CSUs.	[2]Real work conditions under workplace supervision. Off-job assessment	Low / Medium	On going

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Assessment method	Appropriate instruments	Valid purposes or use	Conditions and numbers	Time constraints	Repeat assessments possible
		Identifies when remedial action is required during development period.	events Any number		

[1] A valid profile is based on periodic collection of relevant data over the duration of a competency development training program.
[2] A complete profile is constructed from all required evidence of competency, however where a profile of only workplace performance is used it must be supplemented with other methods such as those outlined in this table.

1.3.09 Conducting Assessment

3.9 Conducting Assessment

This section details the mandatory assessment requirements and provided information on equity in assessment, including reasonable adjustment.

Mandatory Assessment Requirements

Assessments must meet the criteria set out in the AQTF 2010 Essential Standards for Initial and Continuing Registration or Standards for NVR Registered Training Organisations 2012. For information, the mandatory assessment requirements from Standard 1 from the AQTF 2010 *Essential Standards for Initial and Continuing Registration,* or 15.5 of the Standards for NVR Registered Training Organisations 2012 are as follows:

"1.5 Assessment, including Recognition of Prior Learning(RPL):

a) meets the requirements of the relevant Training Package or accredited course,

b) is conducted in accordance with the principles of assessment and the rules of evidence, and

c) meets workplace and, where relevant, regulatory requirements.

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Assessments must meet, at a minimum, the criteria set out in Standard 8 from the *Standards for Registered Training Organisations* which is reproduced below.

8 **RTO Assessments**

The RTOs assessments meet the requirements of the endorsed components of Training Package and the outcomes specified in accredited courses within the scope of its registration.

8.1 The RTO must ensure that assessments, regardless of whether through a training and assessment pathway or an assessment-only pathway:

i comply with the Assessment Guidelines included in the applicable nationally endorsed Training Package or the assessment requirements specified in accredited courses;

ii lead to the issuing of a Statement of Attainment or qualification under the AQF when a person is assessed as competent against nationally endorsed Competency Standard Units in the applicable Training Package or any additional information related to knowledge and skills specifications (e.g. modules) prescribed in the applicable accredited course;

iii comply with the principles of validity, reliability, fairness and flexibility;

iv provide for applicants to be informed of the context and purpose of the assessment and the assessment process;

v where relevant, focus on the application of knowledge and skill to the standard of performance required in the workplace and cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills, and include transferable knowledge and skills to new situations and environments;

vi involve the evaluation of sufficient evidence to enable judgements to be made about whether competency has been attained;

vii identify issues related to techniques, OHS, language and literacy, cultural diversity, under-represented groups, key competencies and skills enabling employment.

viii provide for feedback to the applicant about the outcomes of the assessment process and guidance on future options;

ix are equitable for all persons, taking account of cultural and linguistic needs; and

x provide for reassessment on appeal.

8.2 a The RTO must ensure that RPL is offered to all applicants on enrolment.

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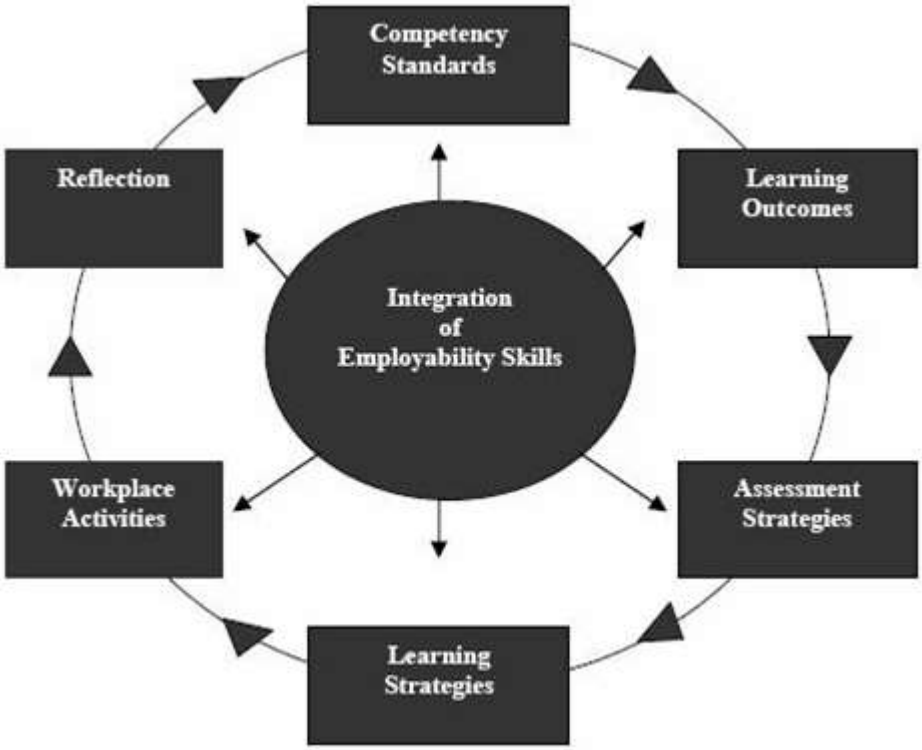
b The RTO must have a RPL process that:

i is structured to minimise the time and cost to applicants; and

ii provides adequate information and support to enable applicants to gather reliable evidence to support their claim for recognition of competencies currently held, regardless of how, when or where the learning occurred.

Assessment of Employability Skills

Employability Skills are integral to workplace competency. As such they must be considered in the design, customisation, delivery and assessment of vocational education and training programs in an integrated and holistic way, as represented diagrammatically below.



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Employability Skills are embedded and explicit within each unit of competency. Training providers must use Employability Skills information in order to design valid and reliable training and assessment strategies. This analysis could include:

- reviewing units of competency to locate relevant Employability Skills and determine how they are applied within the unit
- analysing the Employability Skills Summary for the qualification in which the unit or units are packaged to help clarify relevant industry and workplace contexts and the application of Employability Skills at that qualification outcome
- designing training and assessment to address Employability Skills requirements.

For more information on Employability Skills in the ElectroComms and Energy Utilities Training Packages go to the E-Oz website at www.e-oz.com.au

Access and Equity

An individual's access to the assessment process should not be adversely affected by restrictions placed on the location or context of assessment beyond the requirements specified in this Training Package: training and assessment must be bias-free.

Under the rules for their development, Training Packages must reflect and cater for the increasing diversity of Australia's VET clients and Australia's current and future workforce. The flexibilities offered by Training Packages should enhance opportunities and potential outcomes for all people so that we can all benefit from a wider national skills base and a shared contribution to Australia's economic development and social and cultural life.

Reasonable Adjustments

It is important that education providers take meaningful, transparent and reasonable steps to consult, consider and implement reasonable adjustments for students with disability.

Under the *Disability Standards for Education 2005*, education providers must make reasonable adjustments for people with disability to the maximum extent that those adjustments do not cause that provider unjustifiable hardship. While 'reasonable adjustment' and 'unjustifiable hardship' are different concepts and involve different considerations, they both seek to strike a balance between the interests of education providers and the interests of students with and without disability.

An adjustment is any measure or action that a student requires because of their disability, and which has the effect of assisting the student to access and participate in education and training on the same basis as students without a disability. An adjustment is reasonable if it achieves this purpose while taking into account factors such as the nature of the student's disability, the views of the student, the potential effect of the adjustment on the student and others who might be affected, and the costs and benefits of making the adjustment.

An education provider is also entitled to maintain the academic integrity of a course or program and to consider the requirements or components that are inherent or essential to its nature when assessing whether an adjustment is reasonable. There may be more than one adjustment that is reasonable in a given set of circumstances; education providers are required to make adjustments that are reasonable and that do not cause them unjustifiable hardship.

The Standards for Package Guidelines provides more information on reasonable adjustment, including examples of adjustments. Go to http://www.nssc.natese.gov.au/training_packages

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Industry-preferred assessment process

The following describes the industry-preferred process for conducting assessments against the competency standard unit(s) in this Training Package. This process applies to all assessments conducted for the purposes of national recognition.

- Assessment within the Electrotechnology Industry must be carried out by a qualified assessor trained in the conduct of assessment.
- Assessment should be planned, arranged and organised well in advance of the event/process.
- The candidate should be involved in the planning and preparation so that their readiness and availability is assured and their advice on evidence collection opportunities may be considered.
- The environment within which assessment is to occur is acceptable to the parties and conducive to the assessment process.
- The assessor's actions throughout the process are firm, fair, friendly and unambiguous.
- Specific rulings on safety breaches are explained up-front and acted upon in accordance with the assessment materials.
- The assessment process should contain no surprises for any party.
- Feedback is provided as required throughout the assessment process.
- Post assessment activities including recording, reporting, counselling etc. are finalised promptly.
- Candidates are more likely to accept the outcomes of an assessment process in which:
- they consider they were treated fairly, consistently and with dignity
- they were given the full opportunity to demonstrate their capabilities
- the reasons for the assessment decisions were appropriate, logical and constructively explained
- the assessment judgements are conveyed in a sensitive and constructive manner.

Below is an overview for assessment within the Electrotechnology Industry. It outlines the process involved in conducting assessment in both the institutional and workplace context, and consists of three major components that each assessor will need to do.

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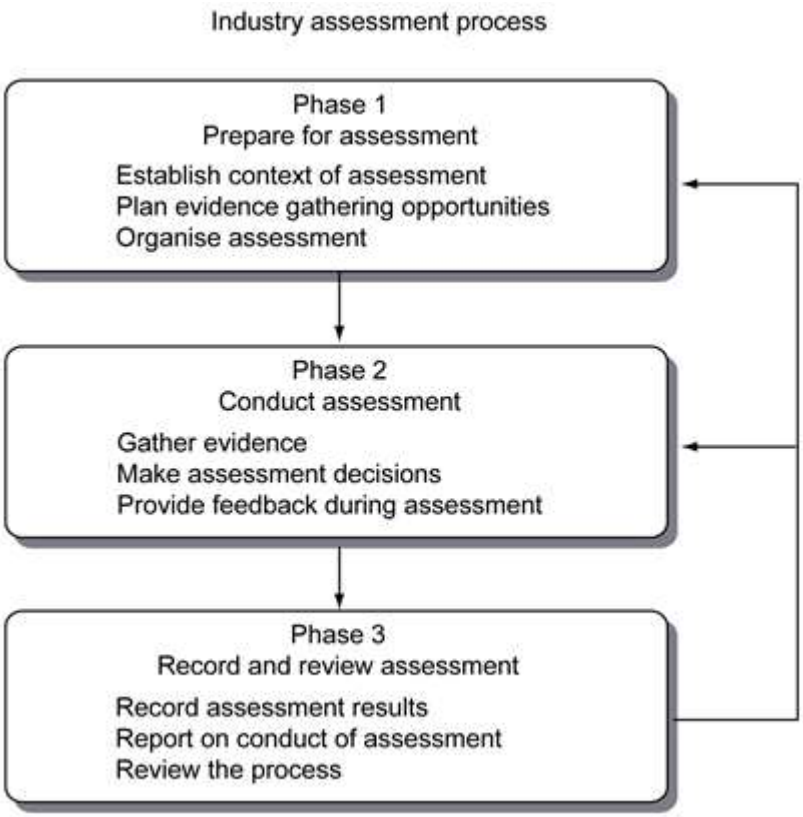

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Phase 1 Prepare for assessment

The assessor:

- establishes the context and purpose of the assessment
- identifies the relevant competency standard unit(s) and assessment guidelines from this Training Package including the relevant performance measures applying to assessment
- identifies any NTQC-noted support materials that have been developed to facilitate the assessment process
- analyses the competency standards and identifies the evidence requirements
- identifies potential evidence collection methods
- identifies issues related to techniques, OHS, language and literacy, cultural diversity, under-represented groups, key competencies and skills enabling employment.

Prepare the candidate

The assessor meets with the candidate to:

- discuss and confirm the purpose of assessment with the candidate and where appropriate, the employer
- explain the context and purpose of the assessment and the assessment process
- explain the competency standards to be assessed and the evidence to be collected and ensure the candidate has access to the relevant competency standards and any other relevant information
- explain and obtain agreement to the assessment procedure
- advise on self-assessment, including processes and criteria
- outline the assessment procedure, the preparation the candidate should undertake, and answer any questions.
- assess the needs of the candidate and where applicable negotiate reasonable adjustment when assessing people with disabilities; reasonable adjustment must not compromise the integrity of the competencies
- seek feedback regarding the candidate's understanding of the competency standard unit(s), evidence requirements and assessment process
- determine if the candidate is ready for assessment and, in consultation with the candidate, decide on the time and place of the assessment
- develop an assessment plan
- discuss the Electrotechnology Industry and enterprise assessment policy with the candidate, how the competencies to be assessed fit in with the industry training policy and the preferred framework or enterprise arrangements for training and assessment. The assessor should also discuss what the candidate has done to acquire the knowledge and skills.

Plan and prepare evidence-gathering process

Practical assessment is preferably conducted on-site. However, if on-site practical assessment is not possible then off-site assessment at a mutually agreeable site could be appropriate. It can be a part of the current work or a simulated task.
The assessor must:

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- establish a plan for gathering sufficient quality evidence about the candidate's performance in order to make the assessment decision (and involve industry representatives in the development of plans for the validation of assessment)
- identify opportunities to gather evidence of competence which occurs as part of the workplace activities
- ensure the planned approach to gathering evidence will provide sufficient, reliable, valid and fair evidence of competence
-
- source or develop assessment materials to assist in the evidence gathering process
- choose the techniques that will be used to assess the candidate’s knowledge and skill
- organise equipment or resources required to support the evidence gathering process
- check that the assessment environment allows for fair, valid and reliable assessment and that it is safe and accessible
- inform other relevant people of assessment plans
- coordinate and brief other personnel involved in the evidence gathering process
- identify the need to gather additional evidence which may not occur as part of workplace activities
- consider issues related to techniques, OHS, language and literacy, cultural diversity, under-represented groups, key competencies and skills enabling employment.

Phase 2 Conduct the assessment

Collect the evidence and make assessment decisions

The assessor must:

- establish and oversee the evidence gathering process to ensure its validity, reliability, fairness, flexibility and consistency.
- collect appropriate evidence and assess this against the Elements, Performance Criteria, Range Statement and Evidence Guide in the relevant competency standard unit(s)
- evaluate evidence in terms of the four dimensions of competency – task skills, task management skills, contingency management skills and job/role environment skills
- incorporate allowable adjustments to the assessment procedure without compromising the integrity of the competencies
- evaluate the evidence in terms of validity, consistency, currency, equity, authenticity and sufficiency
- gather evidence related to techniques, OHS, language and literacy, cultural diversity, under-represented groups, key competencies and skills enabling employment
- consult and work with other staff, assessment panel members or technical experts involved in the assessment process
- document the evidence gathered in accordance with the assessment procedure and record details of evidence collected
- make a judgement about the candidate's competency based on the evidence and the relevant competency standard unit(s) and the criteria specified in the assessment procedure.

Provide feedback on the assessment

The assessor must provide advice to the candidate about the outcomes of the assessment process.

This includes providing the candidate with:

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- clear and constructive feedback on the assessment decision
- information on ways of overcoming any identified gaps in competency revealed by the assessment
- the opportunity to discuss the assessment process and outcome
- information on reassessment and the appeals process.

Phase 3 Record and review assessment

Record and report results

The assessor must:

- record the assessment outcome according to the policies and procedures of the RTO
- maintain records of the assessment procedure, evidence collected and the outcome according to the policies and procedures of the RTO
- maintain the confidentiality of the assessment outcome
- organise the issuing of qualifications and/or Statements of Attainment according to the policies and procedures of the RTO.

Review assessment process

- On completion of the assessment process, the assessor must:
  - review the assessment process
  - report on the positive and negative features of the assessment to those responsible for the assessment procedures
  - if necessary, suggest to appropriate personnel in the RTO ways of improving the assessment procedures.

Participate in the reassessment and appeals process

The assessor must:

- provide feedback and counsel the candidate, if required, regarding the assessment outcome or process, including guidance on further options
- provide the candidate with information on the reassessment and the appeals process
- report any disputed assessment decision to the appropriate personnel in the RTO
- participate in the reassessment or appeal according to the policies and procedures of the RTO.

Review and maintenance of the assessment system

E-Oz Energy Skills Australia as the developer and custodian of this Training Package is responsible for the ongoing monitoring and review of these Assessment Guidelines. This process will be incorporated in the general review and maintenance of this Training Package.

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1.3.10 Guidelines for Designing Assessment Materials

3.10 Guidelines for Designing Assessment Materials

Assessment materials are developed, designed and implemented by appropriately authorised and competent assessors. The materials may range from relatively straight forward questions/answers and task tests to quite elaborate simulations for assessing concepts and values. Assessment materials should facilitate the process of assessment by:

- detailing the personnel and material preparations required to support the **assessment** process
- establishing and/or confirming the circumstances under which the assessment is to take place
- detailing the evidence to be collected and the method(s) to be used to do this
- providing for the systematic review/analysis of the evidence on which logical and supportable judgments are made
- providing the means for recording the process and the judgments as required and in accordance with any regulatory and/or industry preferred arrangement
- providing a basis for post-assessment
- providing **counselling** and guidance for the candidate
- identifying specialist technical advice related to such things as OHS, LLN, **environmental** and equity matters.

Assessment Material Design Process

The three Phases in the process of designing assessment materials are:

- **Determine assessment requirements. This includes identifying appropriate assessment tools and methods**
- **Develop assessment tools and methods. This involves designing and/or modifying tools, and preparing instructions**
- **Trial and review assessment tools. This includes ratifying procedures and making improvements.**

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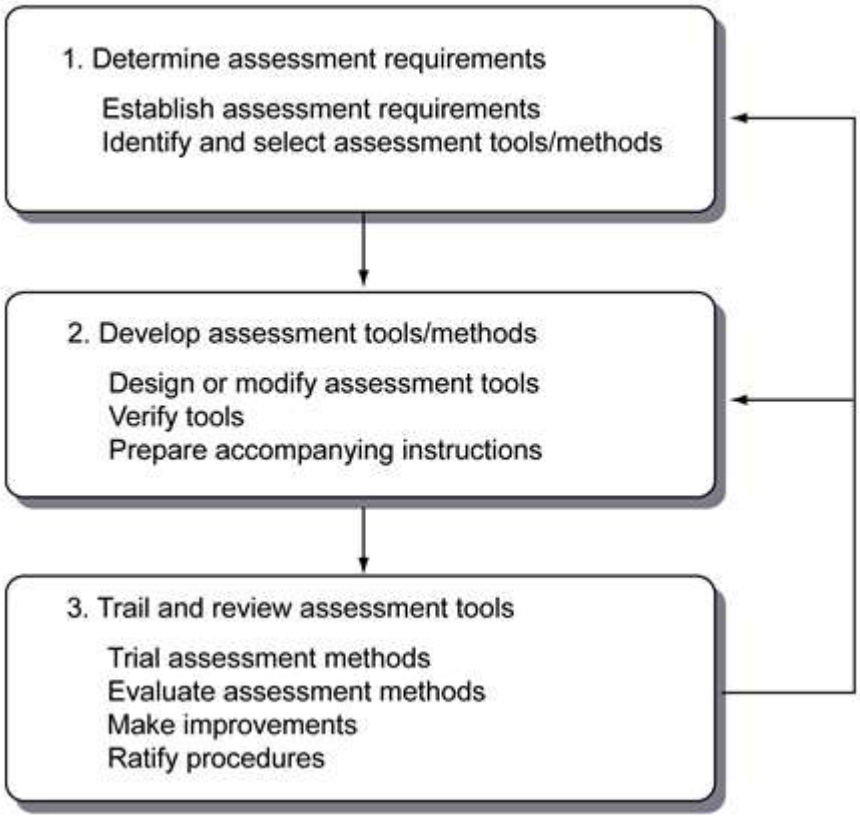
Process for designing assessment materials



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1 Determine assessment requirements

1.1 Identify assessment requirements. In the development of tools and methods of assessment, the assessor will need to determine the range of methods appropriate to the assessment context and the characteristics of the person being assessed. The assessor may use the following questions when designing the assessment method:

a) Is the data **gathering** process sufficient, timely, valid and reliable to ensure the decision about competence relates to the overall requirements of the unit?

b) Do you always need to assess real work?

c) How is the **critical** evidence specified?

d) How many **assessment** tasks are required to collect the critical evidence of competency?

e) Which **assessment** tasks will provide a broad coverage of the Range Statement?

f) Are there any skills that the candidate should have or can develop before they are assessed for the unit?

1.2 Identify and select assessment tools/methods. The assessor must identify and select the assessment methods consistent with Electrotechnology Industry assessment guidelines and procedures.

2 Develop assessment tools/methods

2.1 Design or modify assessment tools. The assessor must design or modify existing assessment tools so that their format, language, literacy and numeracy requirements are appropriate to the characteristics of the assessment context and the person being assessed.

2.2 Verify tools. The assessor must verify the assessment tools, which maintain validity but are easy to administer, and allow sufficient flexibility to meet the range of possible assessment contexts.

2.3 Prepare accompanying instructions. The assessment system/process must be comprehensively and clearly documented so that the stages of assessment and their constituent parts may be observed and evaluated. The assessment materials must relate directly to the competency standard unit or group of units making up a qualification and address the totality of competency in a realistic, holistic and effective way.

3 Trial and review assessment tools

3.1 Trial and validate assessment tools. The assessor must trial and validates the assessment methods with a representative group of people similar to those who will ultimately be assessed. Once trials are conducted the assessor must seek responses from all parties and compile and analyse these responses.

3.2 Evaluate assessment methods. The assessor must evaluate the assessment methods and tools for clarity, reliability, validity, fairness and cost-effectiveness.

3.4 Make improvements. The assessor must modify the assessment tools based on the responses to the trials.

3.5 Ratify procedures. The assessor must ratify, with relevant people in the industry, procedures related to evidence requirements, assessment methods and assessment tools, and the processes used in developing them.

Assessment Material Requirements

Essential requirements to be met by assessment materials include the following:

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Assessment of competency standard units. Assessment must directly address the competency standard unit or group of units making up a qualification or Skill Sets and, within this, satisfy the *critical aspects of evidence*, including the related Performance Criteria, Range Statement and essential knowledge and associated skills.

Assessment of practical applications. Summative assessment of practical applications should, whenever possible and practicable, be conducted in a real work environment or in a realistically simulated work environment. Removal of the summative assessment from the real work environment should occur only to the extent necessitated by circumstances such as safety, noise, excessive cost and disruption to equipment operation, and access to the required work.

Learning outcomes or other curricula documents. Outcomes are not to be the primary focus of summative assessment unless their direct relationship to the competency standard unit(s) is formally approved by industry and recorded.

Assessment of essential theory. Summative assessment of the theory (essential knowledge and associated skills) underpinning competent performance is to be sufficiently rigorous and searching to ensure that individuals comprehend why they are doing something, the options they may use to achieve the required goal, and the fact that they can recall and/or locate and, interpret and transfer this information in varying contexts if it is needed at some other time. Typically, the specific level of depth and breadth the individual is required to achieve is contained in industry and RTO sponsored essential knowledge and associated skills knowledge and skills specifications that are aligned to respective competency standard units.

Assessment of under-represented groups or learners with low language, literacy or numeracy skills. Assessment systems must be able to be used for under-represented groups or in cases where learners have low language, literacy and/or numeracy skills. Reasonable adjustment strategies for these groups should be included in any assessment materials used by RTOs (which should be consistent with the quality assurance requirements of State Training Authorities for registration).

Assessment instruments to support training and assessment material design

See Appendix B *Sample assessment instruments to support training and assessment material design* for information on assessment material design, training and assessment activities and sample assessment materials.

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1.3.11 Maintenance of Assessment Guidelines

3.11 Maintenance of Assessment Guidelines

The Electrotechnology Industry Assessment Guidelines were developed and are owned by the industry. The guidelines must be maintained so that they reflect the ongoing needs of the industry sector and respond in a timely manner to changed technologies, work organisation, skills development and related circumstances.
Responsibility for maintaining the Assessment Guidelines is shared by the parties who constitute the sector:

- The maintenance of Assessment Guidelines will be coordinated and managed by E-Oz Energy Skills Australia in its role as a declared Industry Skills Council for ElectroComms and EnergyUtilities
- Suggestions and proposals for changes from all parties are welcome. These should be documented and submitted to E-Oz Energy Skills Australia the DOI declared Industry Skills Council for the ElectroComms and EnergyUtilities Industry.

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1.3.12 Further Sources of Information

3.12 Further Sources of Information

The section provides a listing of useful contacts and resources to assist assessors in planning, designing, conducting and reviewing of assessments against this Training Package.
Contacts

The ElectroComms and Energy Utilities Industry Skills Council
E-OZ Energy Skills Australia
48 Mort St
Braddon ACT, 2602
PO Box 1202
Dickson, ACT, 2602
Ph: 02 6254 5180
Fax: 02 6257 4222
Email: office@e-oz.com.au
Web: www.e-oz.com.au

For information on the TAE10 Training and Education Training Package *contact:*
Innovation & Business Skills Australia
Telephone: (03) 9815 7000
Facsimile: (03) 9815 7001
Email: virtual@ibsa.org.au
Web: www.ibsa.org.au

1.3.13 General Resources

3.13 General Resources

AQF Implementation Handbook, Fourth Edition 2007. Australian Qualifications Framework Advisory Board, 2002 <www.aqf.edu.au>

Australian Quality Training Framework (AQTF) and *AQTF 2010 Users' Guide to the Essential Standards for Registration –*
http://www.training.com.au/pages/menuitem5cbe14d51b49dd34b225261017a62dbc.aspx
Standards for NVR Registered Training Organisations 2012:
http://www.comlaw.gov.au/Details/F2013L00167
For general information and resources go to http://www.training.com.au/

The National Register is an electronic database providing comprehensive information about RTOs, Training Packages and accredited courses - <www.training.gov.au>
The Training Package Development Handbook site provides National Quality Council policy for the development of Training Packages. The site also provides guidance material for the application of that policy, and other useful information and links.
http://www.nssc.natese.gov.au/training_packages

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Assessment Resources

Registered training organisations (RTOs) are at the forefront of vocational education and training (VET) in Australia. They translate the needs of industry into relevant, quality, client-focussed training and assessment.

RTOs should strive for innovation in VET teaching and learning practices and develop highly flexible approaches to assessment which take cognisance of specific needs of learners, in order to improve delivery and outcomes of training.

Assessment Tool Design and Conducting Assessment

VETASSESS and Western Australian Department of Training and Employment, 2000, Designing Tests – Guidelines for designing knowledge based tests for Training Packages.

Vocational Education and Assessment Centre 1997, Designing Workplace Assessment Tools, A self-directed learning program, NSW TAFE.

Manufacturing Learning Australia, 2000, Assessment Solutions, Australian Training Products, Melbourne.

Rumsey, David 1994, *Assessment practical guide*, Australian Government Publishing Service, Canberra.

Assessor Training

Australian Committee on Training Curriculum (ACTRAC), 1994, Assessor training program - learning materials, Australian Training products, Melbourne.

Australian National Training Authority, A Guide for Professional Development, ANTA, Brisbane or its replacement – contact DOI for more information on www.industry.gov.au

Australian National Training Authority, Facilitator Packs for Certificate IV in Training and Assessment or its replacement – contact DOifor more information on www.industry.gov.au

Australian National Training Authority, Facilitator's Pack for Train Small Groups and Assessment or its replacement – contact DOI for more information on www.industry.gov.au

Green, M., Moritz, R., Moyle, K. and Vale, K., 1997, *Key competencies professional development Package*, Department for Education and Children's Services, South Australia.

Victorian TAFE Association, 2000, *The professional development CD: A learning tool*, VTA, Melbourne.

Conducting Assessments

Bloch, B. and Thomson, P., 1994, *Working Towards Best Practice in Assessment: A case study approach to some issues concerning competency-based assessment in the vocational education and training sector*, NCVER, Adelaide.

Docking, R., 1991, *An A-Z of Assessment Myths and Assessment in the Workplace, Competence assessment briefing series*, No. 4, Employment Department, Perth, Western Australia.

Hawke, Geoff, 1996, Integrating Assessment of Learning Outcomes, Assessment Centre for Vocational Education, Sydney.

Hawke, Geoff, 1995, *Work-based Learning: Advice From Literature*, Assessment Centre for Vocational Education, Sydney.

National Assessors and Workplace Trainers Body, *Putting it into practice* [Training Package implementation Guide].

Parsloe, E., 1992, *Coaching, Mentoring and Assessing: A practical guide to developing competence*, Kogan Page, London.

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Rumsey, David, 1993, "*Practical issues in Workplace Assessment*" in National Assessment Research Forum: A forum for research into competency-based assessment. [VEETAC Competency Based Training Working party Assessment Steering Group], NSW TAFE Commission, Sydney.
Rumsey, David, 1994, *Assessment Practical Guide*, Australian Government Publishing Service, Canberra.
Evidence-Gathering Methods
Australian National Training Authority, 1998, *A new assessment tool*, ANTA, Melbourne or its replacement – contact Department of Industry for more information on www.industry.gov.au
Gonczi, A. (ed.), 1992, *Developing a competent workforce: adult learning strategies for vocational education and training*, TAFE National Centre for Research and Development, Adelaide.
Kearney, Paul, 1992, *Collaborative assessment techniques*, Artemis, Tasmania.
National Assessors and Workplace Trainers Body, *The evidence resource kit – containing language, literacy and numeracy video and CD ROM*

1.3.13 Further Sources of Information

3.13 Further Sources of Information

This section provides a listing of useful contacts and resources to assist assessors in planning, designing, conducting and reviewing assessments

Contact	Details
National Industry Skills Council (ISC) for the ElectroComms and EnergyUtilities Industry	**E-Oz Energy Skills Australia** 48 Mort St Braddon ACT, 2602 PO Box 1202 Dickson, ACT, 2602 Ph: 02 6262 7055 Fax: 02 6257 4222 Email: office@e-oz.com.au Web: www.e-oz.com.au

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Contact	Details
Western Australia ITC	WA IEU ITC Inc P O Box 597 BALCATTA WA 6021 Tel: 08 9240 2688 Fax: 08 9240 2930 E-mail: admin@ieu.com.au
New South Wales ITAB	NSW U&E ITAB PO Box 615 DARLINGHURST NSW 1300 Tel: 02 9326 6097 Email: uensw@pacific.net.au Website: www.uensw.com.au
Victoria	**EPIC Industry Training** 29 Drummond St CARLTON VIC 3053 Tel: 03 9654 1299 Fax: 03 9654 3299 Email: epicitb@epicitb.com

Contact	Details
South Australia	**Electrical, Electrotechnology, Energy & Water Skills Board** PO Box 2584 GPO REGENCY PARK SA 5942 Tel: (08) 8347-4008 Fax: (08) 8219-0015 Email: admin@eeewsb.com.au
Queensland	**Energy Skills Queensland** PO Box 160 COOPERS PLAINS QLD 4108

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Contact	Details
	Tel: 07 3216 9604 Fax: 07 3345 8346 Email: qusitab@qusitab.com.au
Northern Territory	Major Industries Training Advisory Council GPO Box 1610 DARWIN NT 0801 Tel: 08 8981 0077 Fax: 08 8941 7470 Email: mitac@mitac.org.au

Access to Assessment Resources

Learning Resources	**E-Oz Energy Skills Australia** 48 Mort St Braddon ACT, 2602 PO Box 1202 Dickson, ACT, 2602 Ph: 02 6262 7055 Fax: 02 6257 4222 Email: office@e-oz.com.au Web: www.e-oz.com.au

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1.3.14 Appendix A - Australian Apprenticeships

3.14 Appendix A – Australian Apprenticeships

Australian Apprenticeships are work-related competency programs designed for entry level contracted employment for new entrants to the industry. All qualifications in this Training Package could be open to use as Australian Apprenticeships and are governed by State/Territory Training Authority arrangements and their limitations.
Australian Apprenticeships offer both employers and employees:

- relevant training
- a range of support service arrangements.

Typically they involve paid work and structured training and are underpinned by a training contract, which is registered with the relevant State/Territory Training Authority. Completion of the competency development program leads to an AQF qualification.
In some instances, and subject to any relevant State/Territory Training Authority arrangements, existing non-apprenticed workers may be eligible for Australian Apprenticeship opportunities. Inquiries with the relevant State/Territory Training Authority should be made in this regard.
Like traditional apprenticeships, Australian Apprenticeships involve a commitment from:

- the employer to provide an environment for systematic training of the Australian Apprentice
- the Australian Apprentices to apply themselves to learning the requirements of their vocation
- a Registered Training Organisation (RTO)[1] to be responsible for providing the vocational education, training and assessment support services and the eventual issuing of a national qualification

In the Electrotechnology Industry, Australian Apprenticeships are available for all the qualifications outlined in this Training Package. Australian Apprentices seeking one of the national qualifications will be required to undergo a training program or course of study that involves learning and assessment activities. The related learning and assessment activities are documented and involve:

- the employer
- the employee
- the RTO.[2]

On successful completion of the training program or course of study, an RTO will issue the Australian Apprentice a national qualification.

[1] TAFE Institutions, universities with TAFE sectors, Skills Centres and similar enterprises that can deliver vocational training are eligible to become RTOs. For more information on RTOs see DEEWR's 2005 *Australian Quality Training Framework Standards for Registered Training Organisations*, effective from 1 July 2005 publication.
[2] TAFE Institutions, Universities with TAFE sectors, Skills Centres and similar enterprises that can deliver vocational training are eligible to become RTOs.

Entry Requirement

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Under Australian Apprenticeships the employer is able to determine the relevant employment criteria for recruiting a new entrant into the Electrotechnology Industry. However, the choice is usually dependent on enterprise employment practices and needs, including requirements that may be imposed by relevant regulations and codes of practice.
Subject to any relevant State/Territory Training Authority arrangements, existing non-apprenticed workers are eligible for Australian Apprenticeship opportunities. Inquiries with the relevant State/Territory Training Authority should be made in this regard.
There is a common set of attributes/profiles that are preferred by the industry for the recruiting of Australian Apprentices.

- Any person aged 15 years or more can apply for an Australian Apprenticeship.
- Most employers require that applicants have completed at least Year 10 of a secondary school education program.

Potential entrants should be aware that employers are looking for the following personal attributes:

- effective numeracy and literacy skills
- effective communications skills
- acceptable presentation
- punctuality
- a positive attitude
- interest in the industry as a career
- ability to work at heights or in confined spaces and around moving machinery
- ability to distinguish between colours.

The terms and conditions for Australian Apprenticeship training require a training agreement or contract, called an Apprenticeship/Traineeship Training Contract, provided by State/Territory Training Authorities and setting out the responsibilities of the parties to the contract.

- Parties to the Apprenticeship/Traineeship Training Contract select the appropriate qualification, appropriate competency standard units and adopt an industry-preferred model or design a new training plan/program that must be agreed to by all parties. Competency standard units used to make up a qualification must be used in the workplace of the employer or be accessible through some job rotation arrangement with other workplaces.

The employment of an apprentice (sometimes also called a trainee) by an employer is subject to the relevant legislation and any applicable industrial instrument, order or determination made under that related Statutory Act. Appropriate information should be obtained from relevant authorities in this regard.

General principles governing the Competency Development Program

In consultation the RTO, the employer and the apprentice/trainee reach agreement on the Competency Development Program that will be delivered. Typically the RTO will adopt the industry-preferred approach where regulatory arrangements are in place or they will design an appropriate program in consultation with the industry. The apprentice/trainee would be expected to undertake the Competency Development Program in order to attain competence in the given qualification.

The Competency Development Program

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The training contract, developed in consultation with the RTO(s) provides a description of the process for undertaking training during the life of the training program. The training plan will outline the required on and off-the-job arrangements that apply to it.

The Training Program

1. Expected duration of workplace program in hours

The training program will detail the anticipated time in hours that the apprentice/trainee is expected to work in order to gain the necessary competencies. Information regarding the suggested nominal duration for AQF levels of Australian Apprenticeships is available from respective parties to the contract of training including E-Oz Energy Skills Australia.

2. On-the-job skills development program

In consultation with the apprentice/trainee and employer, the RTO provides advice on how evidence is to be gathered when the apprentice/trainee is in the workplace. Apprentices/trainees are expected to assist RTOs in gathering and submitting workplace evidence in line with the industry-preferred approach. This is particularly important where regulatory arrangements are in place. RTOs in turn monitor the performance of the apprentice/trainee and provide appropriate feedback to them and the employer.

3. Off-the-job skills development program

The training contract will detail, where applicable, the off-the-job (technical education) program the RTO will deliver to provide the necessary underpinning skills and knowledge. For example where modules or essential knowledge and associated skills strategies apply, the number, title and duration of each will generally be advised. This will also include the expected duration of the technical educational program in hours. Typically this is a program preferred by the industry.

Typical duration of Australian Apprenticeships

A range of influencing factors, including NTQC policy, help to determine the typical period of employment and related training for individuals seeking a qualification, using the Australian Qualification Framework (AQF).

Detailed information on typical Australian Apprenticeship durations, at each of the AQF levels is available from E-Oz Energy Skills Australia. This detail can be obtained directly from E-Oz Energy Skills Australia or found on the E-Oz Energy Skills Australia website at www.e-oz.com.au. Additionally, more specific information may be contained within any related support materials that may exist as non-endorsed components of this Training Package and in particular the industry-preferred training plan applicable to each qualification.

As a general rule it is expected that new entry-level recruits require a ‘nominal duration’ of training to satisfy the outcomes of competency standard units. Nominal duration is usually defined by State/Territory and Federal Training Authority policies and/or regulations, set out in State/Territory Training Package Implementation Guides. For information refer to the relevant Training Package Implementation Guide which can be accessed via the State/Territory Training Authority websites.

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1.3.15 Appendix B - Sample Assessment Instruments

3.15 Appendix B – Sample Assessment Instruments

These instruments are designed to Support Training and Assessment Material Design

This Appendix provides advisory and sample information for assessment material design to benchmark quality outcomes. It also contains information on resources available to support implementation of the Training Package and how these resources relate to the workplace and where they can be obtained.

The sample assessment tools/instruments in this Appendix were developed to assist:

- those involved in benchmarking activities designed to gather and record evidence about workplace tasks and experiences for training and assessment purposes
- in achieving consistency in the assessment of the underpinning knowledge and skills of the units.

The assessment strategies and instruments are primarily for use as advisory information for workplace assessors and/or their agents (workplace supervisors or technical experts) who may be employees of Registered Training Organisations or enterprises.

This Appendix should be read in conjunction with the following publications:

- The relevant volumes of this Training Package
- Training Package for Training and Assessment TAA04
- Training Acts and Regulations in the relevant Australian State/Territory
- Policies of the RTO involved with training and assessment for the industry.

See Appendix A Glossary of Terms for the meaning of specific terms used.

Competency Development Models

This section introduces competency development and/or recognition models based on combined on and off-the-job training and a model that allows individuals to have previous learning and work experience recognised.

Combined on and off-the-job competency development model

This model is structured around a new entry level learner undertaking a full competency development program. It recognises that learning occurs as a result of:

- experience in recurring workplace events
- directed workplace learning activities
- structured off-the-job essential knowledge and associate skills technical educational activities.

The model is a simplified version of the detailed contracted new entry level industry-preferred competency development model. A detailed copy of this model is available from E-Oz Energy Skills Australia website at www.e-oz.com.

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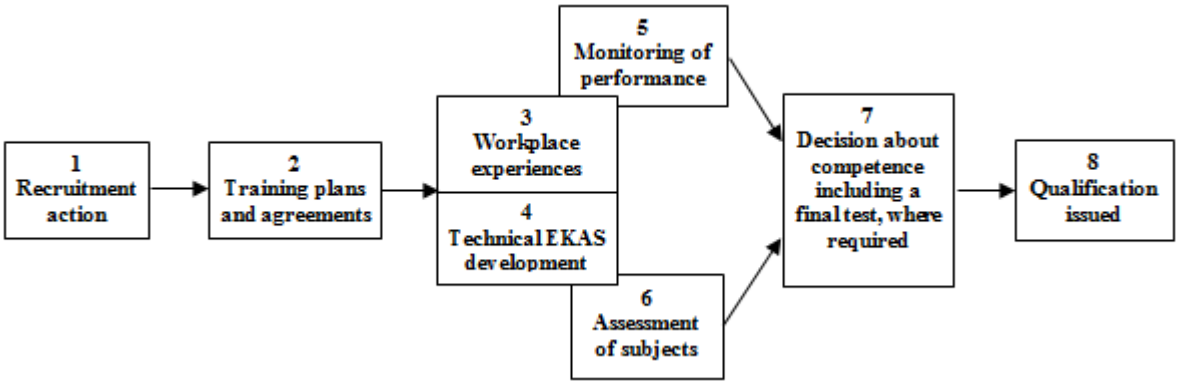

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Competency Development Model

This model can accommodate the assessment of prior learning within the continuum of new entrant to competent. In this way it is consistent with the Assessment Pathways outlined in this Assessment Guidelines part of the Training Package.

New entrant competency development model

In designing training and assessment materials and resources to support new entrant competency development, consideration should be given to the preferred industry approach to learner development, in particular

- recognising learning, eg the trainee has completed some aspects but not all the competency standard unit(s) required
- providing information that is transferable to other environments in the industry.

The concept model detailed on the next page explores how training and assessment materials and resources may be best developed for one or more competency standard units.

Using this approach an RTO can ensure increased consistency in

- meeting the specifications in learning and work performance against the competency standard units
- developing the learner in a cost effective way with little disruption to the day-to-day operation of the workplace.

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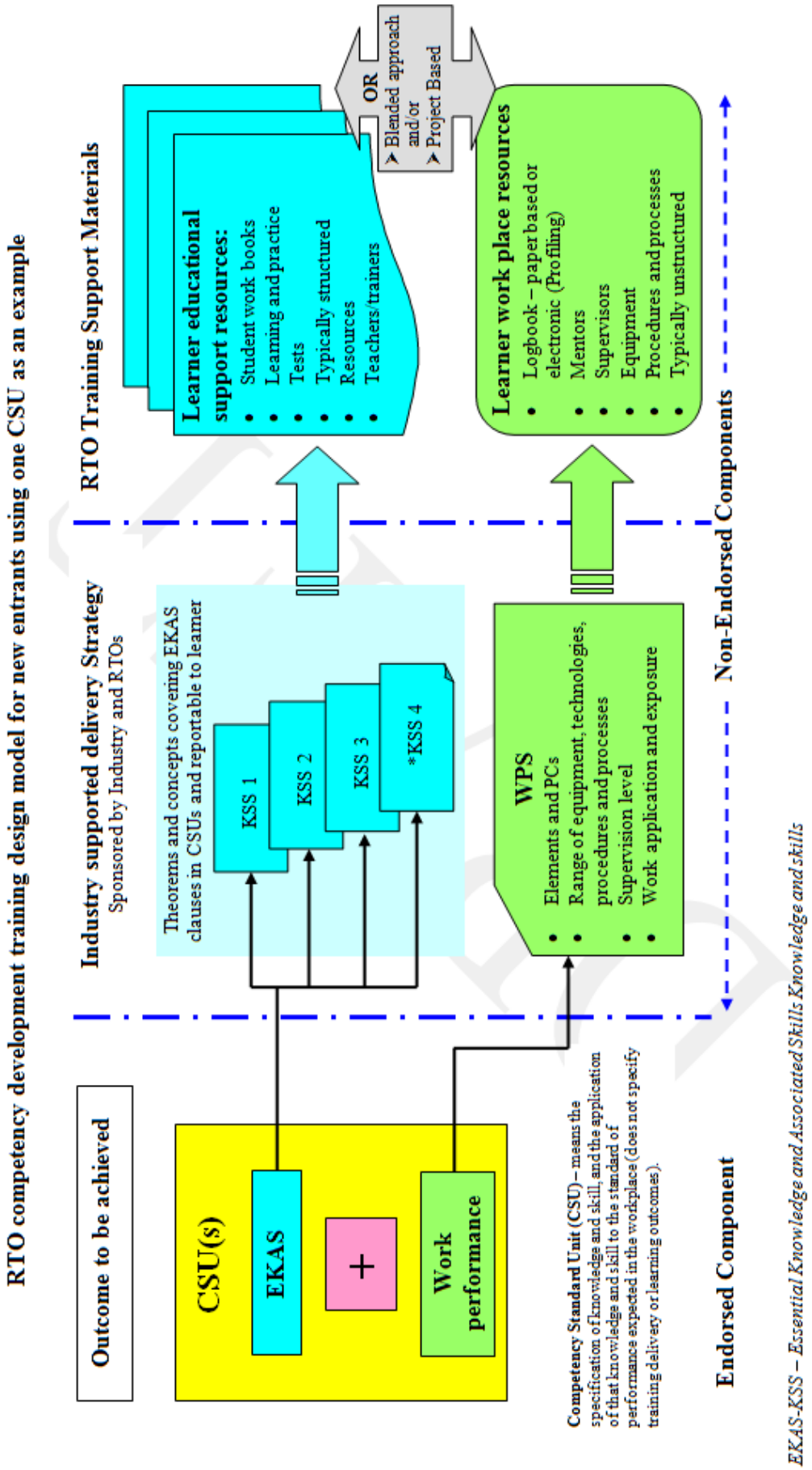

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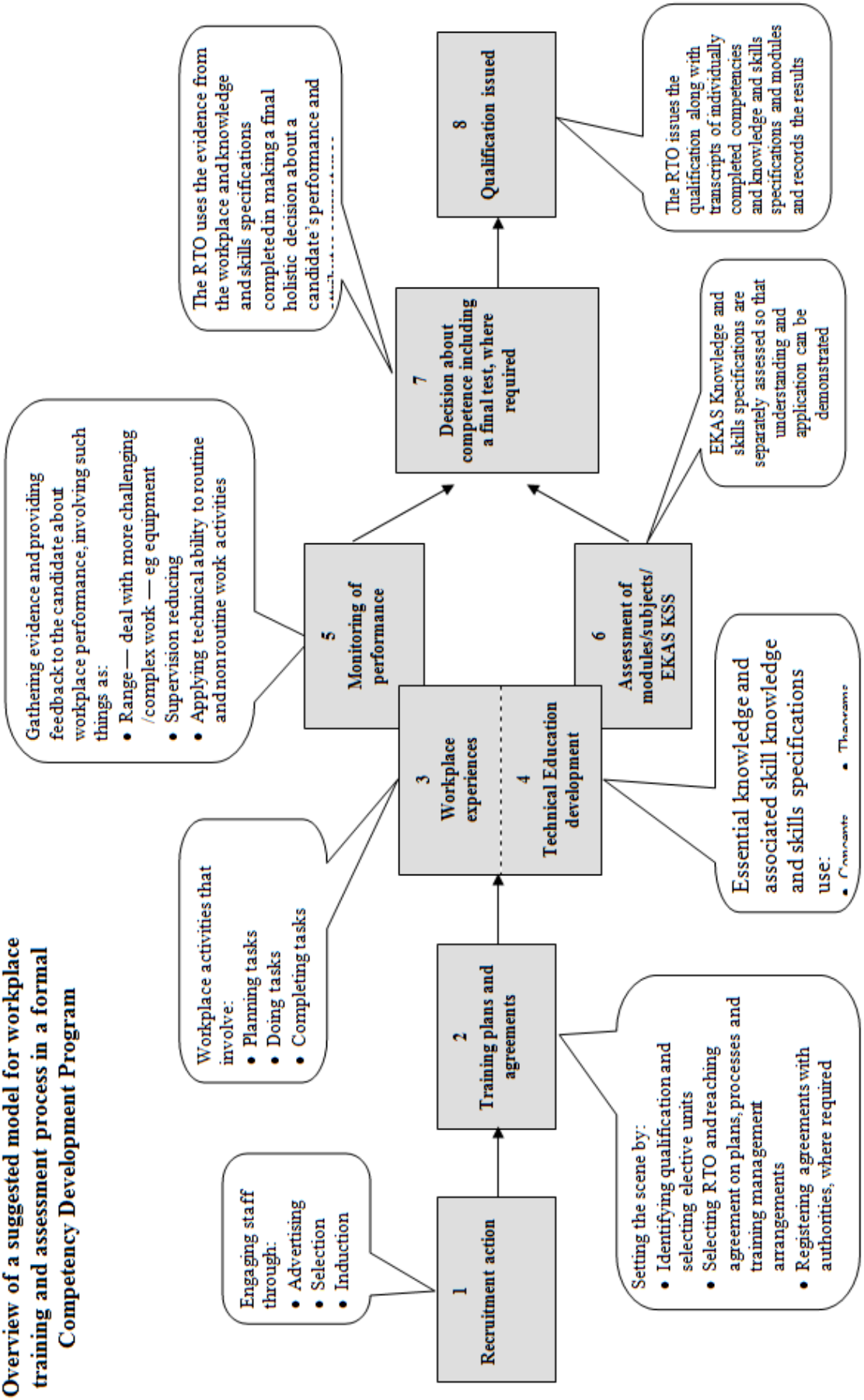
Overview of a suggested model for workplace training and assessment process in a formal Competency Development Program



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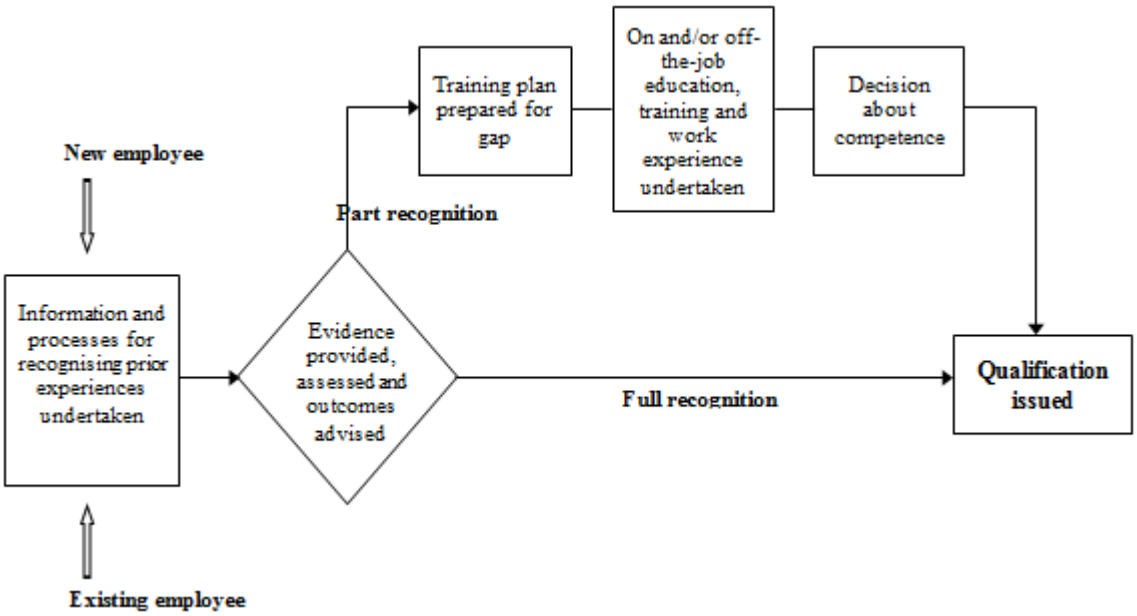
Recognition of Prior Learning/Experience Model

A typical process for candidates seeking to have their prior experiences recognised within the model is shown in the following diagram.



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Learning and Assessment strategies

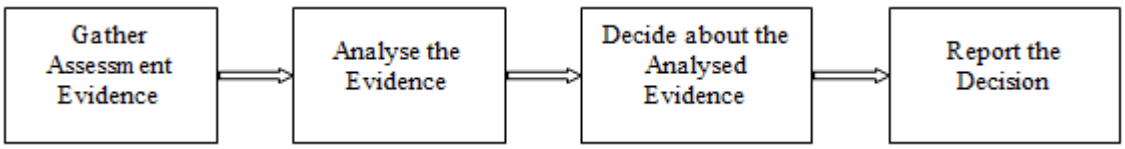
The skills and knowledge required by a competent worker are described in terms of competency standard units. To be assessed as 'competent' against competency standards individuals need to demonstrate that they have the requisite workplace skills and the essential knowledge and associated skills (EKAS) underpinning performance as specified in the competency standard unit.
A candidate must be assessed by a qualified assessor. The assessor must use assessment processes, methods and tools which are in line with this Training Package.
Assessment involves gathering evidence to demonstrate essential knowledge together with requisite skills/work performance. This may include assessment of knowledge and skills obtained through educational courses as well as through application of knowledge and skills in the workplace using workplace processes, equipment and activities.

Assessment Planning

Good planning of workplace assessment is most important. The plan is to be based on a suitable process, one that is in line with the Competency Unit — TAAASS401A Plan and organise assessment. Assessors need to address the following components of competence in Training Package TAA04, which cover:
establishing evidence requirements for a specific context
establishing suitable assessment methods
developing assessment tools appropriate to a specific assessment context
trialling assessment procedure.

The Assessment Process

The general process for assessing competence is shown in the following diagram.



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Assessors need to adapt the process to take account of physical and operational conditions as well as the characteristics and background of the candidate being assessed. Once the process has been finalised, the candidate should be advised.

Assessment Pathways

The Assessment Guidelines of this Training Package identify three assessment pathways for the Industry, as follows:

Pathway 1: For new entrants to the industry
Pathway 2: Recognition of prior learning of those with experience in the Industry
Pathway 3: Recognition of equivalent competency standard units from other Industry Training Packages

Note: Pathway 3 can be incorporated within the Pathway 2 processes and activities.

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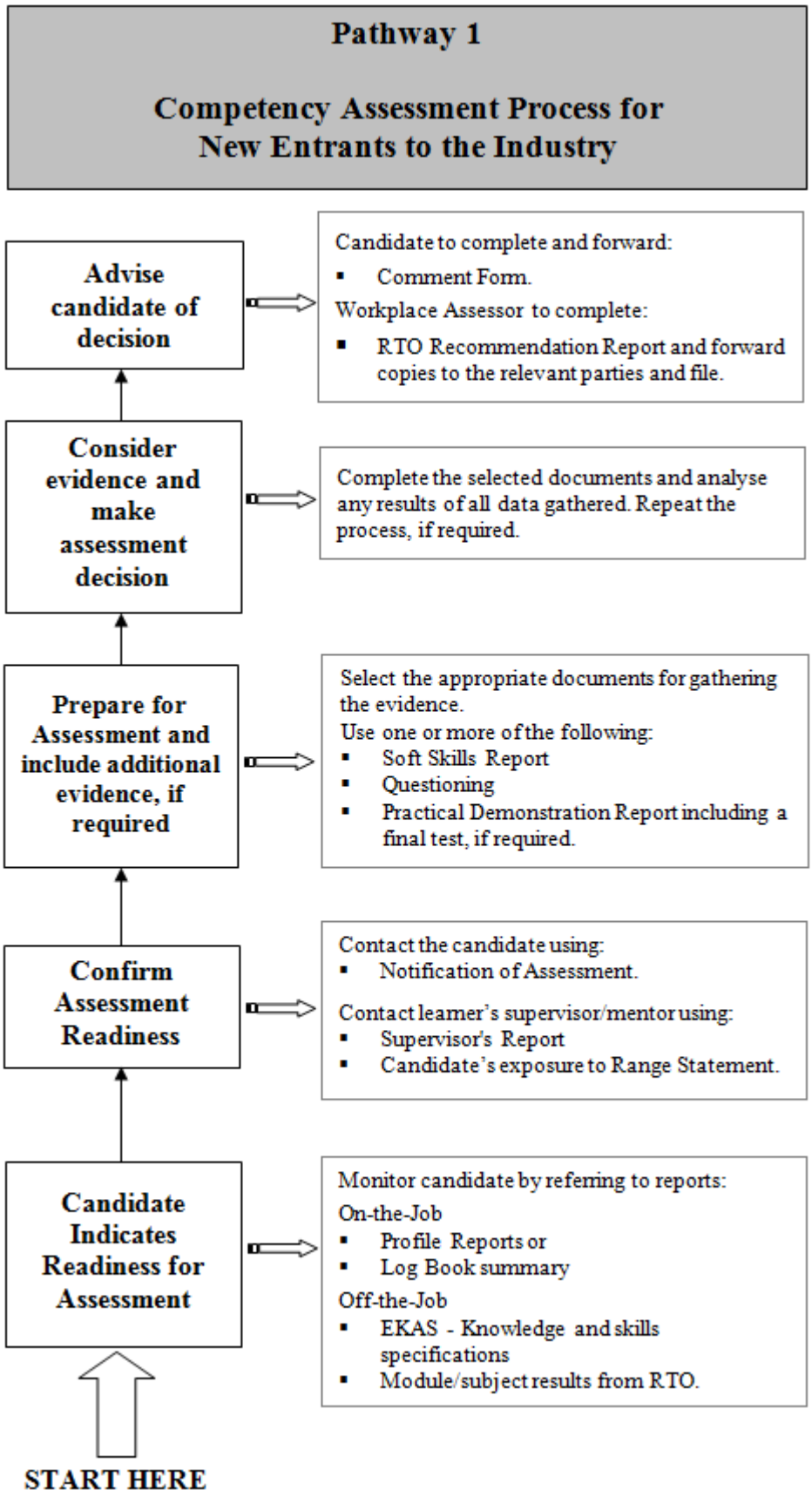

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Pathway 2

Competency Assessment Process for Recognition of Prior Learning of Candidates with Experience

Advise candidate of decision

Workplace Assessor to complete:

- RTO Recommendation Report and forward copies to the relevant parties and file.

Candidate to complete and forward:

- Comment Form.

Authenticity and currency of evidence is checked and/or additional evidence is gathered, where required

Select the appropriate documents for gathering the evidence.

Use one or more of the following:

- Supervisor's Report
- Soft Skills Report
- Questioning.
- Practical Demonstration Report - including a final test, if required.
- ISC(s) equivalence maps — other industry CSUs

Decide the type of additional evidence required and how it will be gathered

Evidence is compared to the requirement outlined in the competency standard unit(s) together with any equivalence map produced by the relevant ISC for other Industry CSUs already held.

Candidate applies for recognition

Candidate prepares a Portfolio of experiences, workplace achievements, and any transcripts of modules or equivalent from RTO(s) and completes:

- Application for Pathway 2 Assessment.
- Candidate's exposure to Elements, PCs and Range Statement.
- Self Analysis Form.

Candidates are advised that a recognition process is available

Promotional materials are made available and the Registered Training Organisation is contacted regarding the arrangements for formal recognition.

START HERE

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Establishing the Evidence Requirements

Training Packages provide a clear statement regarding the evidence requirements in the Evidence Guide and in particular the critical aspects of evidence of each competency standard unit. The following is an extract from one competency standard unit.

'*Critical aspects of evidence required to demonstrate competency in this unit*

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE07". Evidence shall also comprise:

A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- *Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and*
- *Apply sustainable energy principles and practices as specified in the performance criteria and range; and*
- *Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result; and*
- *Demonstrate an appropriate level of skills enabling employment; and*
- *Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and*

Demonstrated performance across a representative range of contexts from the prescribed items below:

- *Verify compliance and functionality of general electrical installations as described as described in 8) and including:*

A – Selecting correct tools and testing equipment
B – Identifying visual non-compliance defects
C – Using effective methods for conducting mandatory and optional tests
D – Identifying non-compliance from test results
E – Identifying causes of non-compliance
F – Completing mandatory reporting
G – Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items'
The evidence on which competency is deemed shall be considered holistically.
'**Items'** of evidence that the industry deems critical and that also relate directly to the Performance Criteria and Range Statements include such items as:

- Specific tools, plant and equipment
- Specific testing techniques
- Any advice limiting assessment to actual workplaces, for example because of licensing, regulatory or unique infrastructure requirements
- Specific licensing and regulatory requirements

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- Any advice dealing with unexpected and non-routine contingencies by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment.

Assessment Methods

Assessment involves determining whether a candidate has provided sufficient evidence to demonstrate that they have a specified level of skills and knowledge which they can apply in their work environment.

- The evidence provided may include:
- work activity records
- a transcript of training outcomes
- a portfolio of learning experiences
- a self-assessment by the candidate against the relevant competency standard(s).
- supervisor's report(s), addressing requirements of the identified competency standard(s)
- practical demonstration
- details of training undertaken linked to requirements of the identified competency standard(s), such as a profiling or 'many samples' reports
- outcomes of a challenge test.

The assessor may use a variety of assessment methods to gather evidence. Appropriate methods for documenting workplace experiences related to this Training Package are:

- on-the-job work observation
- practical exercises in the workplace or under simulated workplace conditions
- appraisal and report by a supervisor/trainer or colleague
- questioning and discussion with the candidate
- written/practical test
- any Industry Skills Council equivalence mapping declaration for competency standard units held from other Industry Training Packages.

Develop the Assessment Tools

The assessment tools include:

- instruments for gathering evidence – samples included as Enclosure A
- forms for administrating the process – samples included as Enclosure B
- assessment design materials Glossary of Terms – included as Enclosure C.

Trial the Assessment Procedure

It is very important to trial the assessment strategy. There is a need to make sure it is appropriate to the context in which the assessment is conducted. This will involve:

- a focus on the specific requirements of the competency standard unit being assessed
- consideration of the characteristics and background of the person being assessed to make sure the assessor supports the candidate in their understanding of the process and the skills and knowledge that need to be demonstrated
- use of assessment methods and instruments to make sure the evidence gathered:
  - addresses the conditions required to meet the Critical Aspects of Evidence as outlined in this Training Package and related competency standard units
  - is drawn from a variety of sources and reflects the required range of work circumstances

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- provides reasonable certainty that the evidence submitted is sufficient, current and authentic.

The selection and application of assessment tools is a decision made by assessors. There is no standard answer, however the following is provided as general guidance.

- Assessors need only gather enough evidence so they can make a judgment that competence has been demonstrated. Too much evidence may be difficult to analyse in a consistent manner, whereas insufficient evidence fails to satisfy the assessment criteria.
- Assessors need to adjust or modify the assessment processes and tools as required, within the constraints of achieving a valid, reliable and fair outcome.
- Assessors need to make sure assessment procedures satisfy the principles of assessment (validity; reliability; flexibility; fairness).
- Assessors need to be cognisant and use the industry-preferred assessment approach, as a first option.
-

Appendix B – Enclosure A: List of Sample Assessment Instruments

Enclosure A1 **Work activity records**
Enclosure A2 **Transcript of training outcomes**
Enclosure A3 **Portfolio**
Enclosure A4 **Self analysis**
Enclosure A5 **Candidates exposure to Range Statement**
Enclosure A6 **Supervisor's report**
Enclosure A7 **Supporting skills report**
Enclosure A8 **Questioning**
Enclosure A9 **Practical demonstration**
Enclosure A10 **Final/challenge test**
Enclosure A11 **Contracted entry level Profiling Model**

Enclosure A1 – Work Activity Records
Work Activity Records summarise:

- relevant activities – jobs/tasks undertaken at work
- associated resources used such as tools, plant/equipment, procedures, and operating systems
- the period of exposure to each type of task
- the level of supervision provided in the workplace.

This type of record is completed by the candidate in conjunction with the supervisor and signed by supervisor. It is important that workplace experiences are documented by candidates to help them see how their work skills and knowledge are developing relevant competency standard units.
Work Activity Records may be produced in hard copy or in electronic form. A Work Activity Record may relate to a group of competency standards or a competency standard unit.
Most often the activities and experiences recorded should be recurring workplace events/performance that involves exposure to a range of plant, tools, equipment, components and operating systems. Appropriate supervision of representative normal work activities is important to a candidate's development.

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Work Activity Records provide valuable data for:

- candidates and their supervisors to track progress in acquiring work-based competencies
- assessors to make decisions about a candidate's level of competence.
- From these records assessors can determine if:
- exposure to the desired workplace activities has occurred
- the level of supervision is in keeping with the degree of autonomy required by the competency standard unit
- the learner is able to perform 'whole of job' activities.

The ElectroComms and EnergyUtilities Industry Skills Council trading as E-Oz Energy Skills Australia has a model hardcopy document that candidates can use to record their workplace activities and experiences. The document is called a User Guide. It is formatted in a way that links workplace activities to competency standard units.
More information, including User Guides and techniques for recording workplace experiences electronically, are available from the E-Oz Energy Skills Australia at website: www.e-oz.com.au.

Enclosure A2 – Transcript of Training Outcomes

Essential knowledge and skills, including that gained from off-the-job training, enables learners to:

- deal with both routine and non-routine technical activities
- readily adapt their skills when new technologies are introduced
- transfer skills to new work environments.

The RTO issuing the credential can generally provide current information about an individual's progress in the essential knowledge and associated skills or mapped modules/topics/subjects.
Learners who have undertaken a recognised structured training program with an RTO should submit a formal transcript – "Statement of Results" (training outcomes) from the issuing RTO as evidence, for inclusion in the process of competency assessment.
Candidates seeking recognition of prior learning need to provide evidence of knowledge and skills equivalent to the content of the essential knowledge and associated skills specifications detailed in the competency standard units in which they are being assessed, as well as their workplace experiences. Applicants for recognition of prior learning may also seek advice from the RTO about the equivalence status of available evidence of their acquired knowledge and skills.
The ElectroComms and EnergyUtilities Industry Skills Council trading as E-Oz Energy Skills Australia at www.e-oz.com.au can provide advice in regard to the availability of the essential knowledge and associated skills knowledge and skills specifications which have been aligned to respective competency standard units and essential knowledge and associated skills clauses.

Enclosure A3 – Portfolio

A portfolio is a collection of documents that demonstrate an individual's professional experiences and achievements in relation to identified competency standards. Typically, portfolios include information from academic achievements, employment record, work activities, supervisor reports and references.
The candidate should prepare his/her own portfolio as an accurate reflection of work and academic history and achievements.

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Assessors advise candidates about the amount, type and format of evidence they should submit for assessment against identified competency standard units.
The use of a Portfolio as an assessment instrument can be enhanced by the use of the Self-analysis form included as Enclosure A4.

Enclosure A4 – Self Analysis

Self-analysis involves candidates in assessing their own level of skills and knowledge acquired through work experience and relevant training programs.
Candidates should complete a Self-Analysis Form in relation to each competency standard being assessed; identifying the evidence they can provide to demonstrate each required component of their skills and knowledge.
Assessors can check the references to determine if the evidence provided links directly or indirectly to the requirements outlined in competency standard units and use this data as part of the overall assessment process.
Typically, the self-analysis form would be used for a Pathway 2 Assessment; however, it could have application in a Pathway 1 Assessment in certain circumstances.

Self-Analysis Application Form

This form allows candidates to summarise their vocational experiences in relation to a particular competency standard units or a group of units. The information provided is used to identify the list of competencies sought for assessment. Candidates need to support their responses to questions, claims and/or comments with authentic evidence. To do this, it is recommended that they develop a portfolio of evidence to be submitted with the Self-Analysis Application Form. The information provided in the Self-Analysis Application Form should be cross referenced with the information provided in the Portfolio.
Candidates must be provided with clear instructions about the information required before they complete each form. They also need to view and understand the detailed requirements of the competency standard unit(s) against which they are seeking assessment. A workplace assessor should assist them with the instructions and details.
Candidates may need to submit a separate Self-Analysis Form for each competency standard unit(s) for which they are seeking recognition.
A sample Self-Analysis Application Form is provided below.

Sample — Self-Analysis Application Form

Enter the codes and title of the National Qualification and title and codes the Competency Standard Unit(s) from qualification for which you are seeking recognition.

Title of National Qualification	**Title and code of Competency Standard Unit(s)** **(For which recognition is being sought)**
	•
	•

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	•
	•
	•
	•
	•

Enter the codes and titles of Certificates, Qualifications, Transcripts of Academic achievement, or Licences that you believe to be supporting evidence.
(Remember to include these documents in your portfolio. You must be able to demonstrate how each document relates to the respective competency standards.)

Code and name of Certificate, Qualification, Transcript of academic record or Licence	Year Achieved

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Note: For all Certificates, Qualification and associated transcripts of academic records identified above, a certified copy must be provided.

Approximately how many jobs have you been involved in that relates to each of the respective Competency Standard Unit(s)?

Competency Standard Unit 1 _____ Jobs
Competency Standard Unit 2 _____ Jobs
Competency Standard Unit 3 _____ Jobs
Competency Standard Unit 4 _____ Jobs
Competency Standard Unit 5 _____ Jobs
Competency Standard Unit 6 _____ Jobs
Competency Standard Unit 7 _____ Jobs

Give details about the **largest** job you have been involved with. Briefly describe the job and where it was carried out. (Portfolio Ref _____)

Estimate the total amount of time (for all similar job mentioned above of all size) you have been involved with - tick box. (Portfolio Ref _____)

	Less than 1 week	1 to 4 weeks	4 to 10 weeks	10 weeks to ½ year	More than ½ year
1					
2					
3					
4					
5					
6					
7					

Describe the level of involvement you have had in this type of work - tick box. (Portfolio Ref _____)

	Carrying out jobs organised by others	Carrying out jobs organised by others and completing all tests and/or writing of reports	Planning the job from the beginning, carrying out the work and completing all tests and writing of reports

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1			
2			
3			
4			
5			
6			
7			

To what extent were you involved in this type of work? Tick box.
(Portfolio Ref _____)

	Carrying out routine tasks	Carrying out and manage several routine tasks at one time	Deal with non routine tasks including diagnosing and rectifying faults	Organising others you work with and dealing with clients
1				
2				
3				
4				
5				
6				
7				

How much training did you require to perform the work? Tick box.
(Portfolio Ref _____)

	Self taught skills	Basic technical knowledge and skills	Analytical technical knowledge and skills	People and customer skills

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1				
2				
3				
4				
5				
6				
7				

To what degree were you supervised when performing the work? Tick box.

Constant supervision	☐	General supervision	☐	Self supervision	☐

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1			
2			
3			
4			
5			
6			
7			

Describe any special features or circumstances about the type of work you have been involved with. (Portfolio Ref _____)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

List as many different types of equipment items you used when you carried out the work associated with the Competency Standard Units. Make the list under headings such as plant, tools, components, systems and the like. A workplace assessor can assist you with the headings. A separate form may be provided for supplying this information. (Portfolio Ref _____)

Unit code	Unit title	Items	

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For the Competency Standard Units, have you completed a whole job using the equipment items listed above? Also indicate the number of times you have done so.

CSU - 1	Involvement (circle yes or no)			Number of times
	Planned the work	Yes	No	
	Carried out the work	Yes	No	
	Completed the work	Yes	No	

CSU - 2	Involvement (circle yes or no)			Number of times
	Planned the work	Yes	No	
	Carried out the work	Yes	No	
	Completed the work	Yes	No	

CSU - 3	Involvement (circle yes or no)			Number of times
	Planned the work	Yes	No	
	Carried out the work	Yes	No	

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	Completed the work	Yes	No	

CSU - 4	Involvement (circle yes or no)			Number of times
	Planned the work	Yes	No	
	Carried out the work	Yes	No	
	Completed the work	Yes	No	

CSU - 5	Involvement (circle yes or no)			Number of times
	Planned the work	Yes	No	
	Carried out the work	Yes	No	
	Completed the work	Yes	No	

CSU - 6	Involvement (circle yes or no)			Number of times
	Planned the work	Yes	No	
	Carried out the work	Yes	No	
	Completed the work	Yes	No	

CSU - 7	Involvement (circle yes or no)			Number of times
	Planned the work	Yes	No	
	Carried out the work	Yes	No	
	Completed the work	Yes	No	

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Declaration by Candidate

All the information provided is entirely factual:

Name: ……

Signed ……..…. Date: ……..

Enclosure A5 – Candidate Exposure to Range Statement

Usually completed by the candidate, this assessment instrument augments other information needed for judging competence. It should provide a list of components from the Range Statement that the candidate has been exposed to in the workplace, e.g. tools, systems, plant, test equipment and associated items. Since the Range Statement is a component part of the whole unit, assessors should ensure that the gathering of evidence by the candidate is seen as a formative part of the assessment process. Once the evidence is presented, a holistic approach to judging and attributing competence is exercised in conjunction with other related data.

Competency standard unit – _____ *(Assessor to complete this section)*		**Candidate to Complete** Identify the items you have worked on
***Range Statement Item Group**	***Range Statement Items Involved**	
A Personal protective equipment	**Goggles**	4
	Gas mask	4
	Boots	
	Gloves	4
B Wiring types	**TPS**	
	MIMS cable	4
	Armoured cable	

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A separate form is required for each competency standard unit. The assessor should complete the following parts of this form in conjunction with the candidate to make sure they are clear about what is required:

- Competency Standard Unit Title and Unit Number
- Candidate's Name
- Date
- Range Statement – Item Group: Please consult the Range Statement as described in section *Establishing the evidence requirements* of this document. Each group alpha character is to represent an appropriate 'group' of variables, such as 'components', 'tools', 'system', 'plant, 'processes', 'equipment', as required by the particular competency standard.
- Range Statement Items Involved: Please list the particular items that have been predetermined as being 'Critical' from the critical aspects of evidence section when the evidence requirements were established (see *Establishing the evidence requirements*).

Candidates place a tick in the column against those items they have been exposed to in a work environment. Candidates should add to the list of items involved, where appropriate. An example is provided below.

Candidate's work experience with items in the
Range Statement listed in this Competency Standard Unit

<table>
<tr><td colspan="2">Competency standard unit title:</td><td>Unit no:</td></tr>
<tr><td colspan="2" rowspan="2">Candidate's name:</td><td>Date:</td></tr>
<tr><td rowspan="6">Candidate to Complete
Identify the items you have worked on</td></tr>
<tr><td>Range Statement Item Group</td><td>Range Statement Items Involved</td></tr>
<tr><td rowspan="5">A</td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table>

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B		
C		
D		

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Declaration by Candidate

All the information provided is entirely factual:

Name: ……

Signed ……..….. Date: ……..

Enclosure A6 – Supervisor's Report

Comments made by the candidate's supervisor/mentor are an important source of evidence for assessors. Typically, the 'supervisor' (mentor) approached to provide a report for competency assessment will have to spend considerable time guiding or monitoring the candidate in his/her development by providing supervised workplace learning experiences, appropriate to the candidate's ability.

Supervisors should be asked to comment on the candidate's ability to:

- demonstrate specific skills as described in the respective aspects of the competency standard units under assessment
- apply required essential underpinning knowledge and associated skills, e.g. as learnt in their technical studies, to the work undertaken
- work independently or in a team in a way that is productive and safe.

The Supervisor's Report can be completed as part of the pre-assessment planning process or during any other part of the process. More than one supervisor can provide information. Assessors should make sure supervisors are clear about the specific detailed requirements of the Electrotechnology Industry Competency Standards targeted for assessment.

A sample report form is provided below.

Supervisor's Report on _____(Learner's Name)	
Name of Supervisor/Assessor: _____	**Date: ___/___/_____**
Position in organisation: _____Contact number:_____	
Approximate time (cumulative) providing guidance to the candidate _____days / hrs in Unit(s): _____ _____	
Responses made by supervisors/mentors are for the purpose of providing information to	

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a workplace assessor. The supervisor is not making a decision about competence. The assessor will include the information with other data in the decision making process.			
Question asked of the supervisor/mentor	**Responses**		
Taking into consideration the candidate technical development and work experiences, can they:	**Yes**	**Requires further training**	**No**
Carry out duties with confidence			
Work in a safe manner with care for self and others			
Perform tasks with the minimal amount of waste or rework			
Complete tasks within a reasonable time			
Identify ways of improving how jobs are done			
Initiate action to improve processes or practices			
Work with others to achieve the work outputs of the group			
Work independently to achieve work outputs			
Resolve non-routine work functions			
Other comments:			
Supervisor's/Assessor's Signature: Date: / /			

Enclosure A7 – 'Supporting Skills' Report

'Supporting Skills' refer to non-technical skills which are embedded in all the competency standard units. Demonstration of these is an essential part of competency assessment. Non-technical skills include:

- the ability to work independently or in teams while dealing with customers
- knowledge of and ability to follow enterprise policies

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- communication skills used in following and issuing instructions
- knowledge of and ability to address quality assurance requirements
- personal management and development skills
- knowledge of and ability to address environmental protection and sustainable energy policies issues.

A Supporting Skills Report may be completed by an assessor, the candidate's supervisor or another third party. Below is an outline of aspects covered by Supporting Skills.

Supporting Skills – What do they cover?

1. Enterprise Instructions

Technical manuals

Using enterprise or manufacturers' technical manuals to ensure equipment and parts are installed to manufacturer specifications.

Quality systems

Plan, apply and contribute to quality systems.

Computers systems

Use enterprise documentation and record systems, including where appropriate the use of data-capture equipment such as computers, information systems and technologies.

Environmental and sustainable energy requirements

The safe disposal of used oil, grease and chemicals, the reduction of electrical energy by turning off lights and heating devices and minimising the impact that engineering practices have on the environment.

Occupational Health and Safety (OHS) requirements

Follow OHS and standard operating procedures in a manner that is safe to the individual and others.

Equal opportunity / Ethical practice / Cultural diversity

Become familiar with enterprise, equal employment opportunity polices, ethical practices and principles and cultural diversity.

Enterprise vehicles

Vehicle log book details are completed accurately, ensure the vehicle is kept clean and secured, and fuel and liquid levels are maintained.

2. Customer relations

Public

Provide courteous and informative advice during construction, maintenance or service activities.

Workers providing other services

Cooperate with workers providing other construction, maintenance or service activities.

Clients and land owners

Recognise the responsibilities and rights of clients and land owners.

Authorities

Recognise the responsibilities and rights of statutory and other authorities.

3. Self development

Systematicproblemsolving

Solve problems using technical literature, exploring theories, performing calculations and by making enquiries.

Personal well being

Maintain and promote personal well being in the workplace through fitness and by avoiding excessive use of alcohol, tobacco and other harmful substances.

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Time management
Be punctual, complete work activities on time/to deadline and sequence activities to maximise the use of available time.
Professional development
Seek to improve technical ability by discussions with others or by technical research and on-going competency development.

4. Team work

Communication
Communicate plans, information, intentions and safety criteria to others using appropriate means.

Team involvement
Contribute positively to the work-team environment.

Competency Enhancement
Participate in the training of others by sharing ideas, explanation of operating systems and detailing the working arrangements of components and equipment.

Instructions for Completing the Supporting Skills Report
When completing a Supporting Skills Report, the workplace assessor (or nominee) should refer to documentation, ask the candidate questions and/or seek advice from the candidate's supervisor/mentor.
Complete the form in the following way.

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Step 1

Place a cross (X) in the box to indicate areas from where evidence has been sourced.

Supporting Skills Report		
Candidate's name		**Date**
Supervisor's/Assessor's name		/ /
Enterprise instructions 1. Applies correctly without constantly making reference to them. 2. Refers to them regularly and applies information correctly. 3. Awareness of their existence but not referred to or used.		**Rating** **1** **2** **3**
Technical manuals	X	Identify a minimum of three.
Quality systems	X	
Computer systems	X	
Environmental requirements	X	

Step 2

Review documentation and/or ask questions of the learner or their mentor/ supervisor.

Step 3

For each area, establish the appropriate level (1, 2 or 3) that reflects the capability of the learner. Place a circle around the corresponding number. Evidence should be collected from a number of sources before rating the candidate.

Note: A rating of 2 or 3 indicates further training or experience is required. A rating of 1 indicates the candidate has demonstrated their competence in this area.

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Supporting Skills Report		
Candidate'sname		Date
Supervisor's/Assessor's name		/ /
Enterprise instructions 1. Applies correctly without constantly making reference to them. 2. Refers to them regularly and applies information correctly. 3. Awareness of their existence but not referred to or used.	***Rating (circle #)*** **1** **2** **3**	
Technical manuals		**Identify a minimum of three.**
Quality systems		
Computer systems		
Environmental and sustainable energy requirements		
Occupational health and safety requirements		
Equal opportunity/Ethical practice/Cultural diversity		
Enterprise vehicles		
Customer relations 1. Customers are included in discussion effecting operational issues 2. Knowledge of but limited application of customer relations. 3. Requires more understanding of customer needs.	***Rating*** **1** **2** **3**	
Public		**Identify a minimum of two.**
Workers providing other services		
Clients and land owners		
Authorities		
Self development 1. Desire to expand beyond the present job role.	***Rating*** **1**	

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2. Keeps abreast of new products and services. 3. Requires more understanding of the job role.	**2** **3**	
Systematic problem solving		**Identify a minimum of two.**
Personal well being		
Time management		
Professional development		
Team Work 1. Shares ideas, assists and accepts assistance from others 2. Accepts ideas and assistance from others. 3. Prefers not to assist or accept assistance from others	***Rating*** **1** **2** **3**	
Communications		**Identify a minimum of two.**
Team involvement		
Competency enhancement		

Enclosure A8 – Questioning

As part of the assessment process it may be necessary to gather additional evidence to clarify specific aspects of competence.

The RTO assessor (or their nominee) may need to ask questions of the candidate, their supervisor or their trainer. A form is provided in this enclosure for documenting their responses. The form provides guidelines for questioning a candidate about the Performance Criteria related to each Element of competence. Below are two tables which provide guidelines for assessing a candidate's response to these questions.

If the assessment is formative, part of a training process, the response given by the candidate should be consistent with the 'Appropriate coverage to questions – level 1'.

If the assessment is summative, final, the responses should be consistent with the 'Appropriate coverage to questions – level 2'.

Note to assessors:

1. As competency standard units are typically structured around PLAN, CARRY OUT and COMPLETE jobs in the workplace, the form for recording responses is generic.
2. Please make reasonable adjustments to the form as required to accommodate particular aspects of individual Competency Standard Units.

Level 1**Appropriate Coverage of Responses to Questions**

Element 1 – Planning for job/task functions (L1)
Issues about involvement of personnel, enterprises operational requirements and the requirements of regulators would not normally be expected.

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Element 1 – Planning for job/task functions (L1)
Coverage should involve such things as: **OHS** • Clarifying instructions given if any doubt exists as to what is required. • Checking with others involved if any personal protective equipment is needed. • Identifying hazards and risks associated with the wok, including any first aid and other similar requirements **Tools, equipment etc** • Identifying the tools and equipment that are required. • Explaining where any special equipment is located and how arrangements will be made to have them available, if required. **The work schedule** • Identifying: - the work and relevant processes, procedures and personnel required - the process of work to be undertaken - the work site activities and issues to be attended to - the authorities associated with the work - any isolation procedures/permits that may apply.

Element 2 – Carrying out job/task functions (L1)
Coverage should involve such things as: **OHS** • Keeping: - the immediate work area clear of debris - tools clean and organised when not in use - clear of moving parts, live electrical conductors, hazards, and obstacles. • Wearing work clothes and personal protective equipment when required. • Performing the technical work required. • Applying the relevant knowledge and skills underpinning performance. **Tasks** • Following instructions given by others. • Observing what is occurring, listening to explanations about why tasks are performed in certain ways and asking questions when required.

Element 3 – Completing job/task functions (L1)
Coverage should involve such things as:

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- Cleaning tools and equipment.
- Returning tools and equipment to their normal storage place.

Level 2 **– Appropriate Coverage of Responses to Questions**

Element 1 – Planning for job/task functions (L2)

Coverage should involve, but not be limited to, such things as:

OHS

- Clarifying instructions given if any doubt exists as to what is required.
- Arranging for any special personal protective equipment to be available.
- Checking to see if the work site is accessible.

Personnel

- Identifying other personnel involved in the work and coordinating proposed activities.

Regulatory requirements

- Arranging for relevant work instructions and installation specifications to be available, if required.
- Arranging work permits/isolation, etc.

Tools, equipment etc

- Ensuring that the tools and equipment that are required are available.
- Coordinating where any special equipment is located and how arrangements will be made to have them available, if required.

The Work Schedule

- Confirming:
  - the plan and process of work to be undertaken
  - the work and relevant processes, procedures and personnel required
  - the work site activities and issues to be attended to
  - the authorities associated with the work
  - isolation or work permits authorities.

Element 2 – Carrying out job/task functions (L2)

Coverage should involve, but not be limited to, such things as:

OHS

- Keeping the immediate work area clear of debris.
- Keeping tools clean and organised when not in use.
- Keeping clear of such things as moving parts, live electrical conductors and obstacles.

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- Wearing work clothes and personal protective equipment when required.
- Having barriers in place to exclude public access to the work place, as required.
- Ensuring all personnel involved are alerted to work activities and communications are established and maintained.
- Keeping alert to the working environment while watching for unexpected occurrences.
- Confirming appropriate competence of first aid and persons, including other requirements such as confined space and the like, where appropriate.

Engineering tasks – specific actions should be included that are additional to the following

- Performing tasks independently with reference to enterprise instructions.
- Accept and act on initial advice and feedback provided by others.
- Observing what is occurring, listening to explanations about why tasks are performed in certain ways and asking questions when required.
- Applying essential knowledge and associated skills and providing solutions to "what if" scenarios.

Technical assistance

- Further reference to enterprise instructions.
- Reference to the requirements of regulations, work instructions or other relevant standard.
- Recall of theory or application.
- Involvement of others with greater experience.

Element 3 – Completing job/task functions (L2)

Coverage should involve, but not be limited to, such things as:

Performance checks

- Checking that all guards and covers removed during the activities are replaced & adjusted.
- Checking that all temporary arrangements required during the process work have been removed.
- Carrying out any tests required by regulation or work instructions.
- Operating the installed/repaired parts or system to ensure it functions as specified.

Notification

- Informing all immediate personnel involved that the work is completed.
- Informing clients and others that the work is completed.
- Removing all signs and barriers, as necessary.
- Reporting any damaged tools and equipment and arrange replacement.

Paperwork

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Element 3 – Completing job/task functions (L2)
• Completing store/inventory paperwork. • Completing the work log or management reports by recording what occurred and providing recommendations/solutions to be followed up in point form.

Instruction for Recording Responses to Questions

Step 1
Identify the elements of competence on which questions will be asked.
Step 2
Identify if the response expected is typical of the candidate undergoing a formative assessment (level 1) or summative assessment (level 2). This may be different for each element involved.
Step 3
Ask the main question and indicate (Y or N) whether the candidate's response addresses the range and depth required.
Step 4
Ask follow up questions to probe any areas not recorded as Y in Step 3. Record Y or N to the response given in the space provided.

From all the evidence presented a holistic judgement is then made.

Questions

Unit Title: **No.**					
Candidate's name: **Assessors name:**					
Main Question for the '*Planning Work*' Element **What are the main things you would**	**Expected Response Level**			**Not used**	
	(circle)	**1**	**2**	**(tick)**	

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Unit Title: **No.**	
Candidate's name: **Assessors name:**	
consider when you are planning and preparing for work?	
Issues to be covered in response to the main question – and – follow up questions, if required	**Coverage** **(Y or N)**
What occupational health and safety issues do you consider?	
Who are the personnel you would involve?	
• What enterprise requirements need to be taken into account?	
What regulatory requirements need to be taken into account?	
What tools, equipment and other items need to be arranged to do this job, where will you get them from and how will you arrange to have them made available when you need them?	
What work schedule will be followed?	

Main Question for the '*Carry-Out Work*' Element **What are the main things you will do**	**Expected Response Level**				**Not used**	
	(circle)	**1**	**2**		**(tick)**	

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Unit Title: **No.**	
Candidate's name: **Assessors name:**	
to ensure the work you carry out is done productively?	
Issues to be covered in response to the main question – and - follow up questions, if required	**Coverage** **(Y or N)**
What are the main OHS practices and precautions that are specific to this work function?	
What are the main engineering tasks involved in carrying out this job?	
What would you do if the work you were undertaking became technically dfficult and you could not complete it to requirements?	
What essential knowledge and associated skills would support a response to providing solutions to "what if" scenarios?	

Unit Title: (Cont.) **No.**						
Main Question for the '*Completing Work*' Element	**Expected Response Level**				**Not used**	
What are the main things you will do **What are the main things you will do**	**(circle)**	**1**	**2**		**(tick)**	

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Unit Title: (Cont.) **No.** *What needs to be done to finalise the job?*	
Issues to be covered in response to the main question – and – follow up questions, if required	**Coverage** **(Y or N)**
What checks need to be made to insure the work you undertook meets specified performance requirements?	
Who do you notify that the work has been completed?	
What paperwork needs to be completed and what will you write about?	

Enclosure A9 – Practical Demonstration

An assessor may need to observe a candidate demonstrating practical tasks. The Engineering Practical Skills Form is designed to help assessor's record work-based observations. In the Sample Form below, notes taken are analysed and a rating is given for the candidate's engineering skills.

Note to assessors:

- The form for recording responses is generic to all competency standard units.
- Make reasonable adjustments to the form as required to accommodate particular aspects of individual competency standard units.
- You may only need to observe candidates on particular (not all) elements of competence.
- If the assessment is formative (for feedback purposes), then the level of supervision that applies during work activities should apply during the assessment activity.

Instructions for Completing the Engineering Practical Skills Form

The form provides a means of recording information about a learner's engineering practice. A workplace assessor (or nominee) does this by observing pre-arranged activities and determining an engineering skills rating.

Step 1

Enter the title of the competency standard unit and the unit number in the space provided.

Step 2

Enter the learner's name in the space provided.

Step 3

Enter the name of the person who is completing the form. This may be the assessor or someone who the assessor nominates to gather the information.

Step 4

Enter the date on which the evidence is gathered.

Step 5

Determine the elements of competence being observed (circle yes or no).

Step 6

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Determine the level of supervision that is to apply to the Elements being observed. Use the Supervision Level Code from the bottom left of the form (A, B or C) and enter it in the second column.

Step 7

Observe the learner perform tasks related to the element(s) being assessed, checking that they address the required Performance Criteria. Record in the first column of the table under the heading 'Notes from Observation' key points to indicate whether the learner has acted in a way that meets specifications required by manufacturers, regulations or client specifications by: following established enterprise procedures, meeting the requirements of the Competency Standard being assessed and not needing prompting during the assessment.

- Needed to be shown or told how to perform tasks beyond what is reasonably expected given his/her level of experience and therefore requires further training.

Step 8

Using the Engineering Skills Rating codes at the bottom right of the table, enter the appropriate letter in the space provided to indicate the level of competence demonstrated in relation to the Competency Standard being assessed.

From all the evidence presented a holistic judgement is then made.

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Engineering Practical Skills Form

Competency Standard Unit title: _____ **Date:** _____/_____/_____

Candidate's name: _____ *Assessor's Name:* _____

Notes from observation	Supervision Enter A, B or C	Engineering Practice Enter D, E, F, G
Plan activities: Yes or No (circle to indicate if evidence is being gathered)		
Carry out activities: Yes or No (circle to indicate if evidence is being gathered)		
Complete activities: Yes or No (circle to indicate if evidence is being gathered)		

Supervision - Level		Engineering Skills - Rating	
A	The learner is working under direct supervision.	D	Met required specifications.
B	The learner is working under limited supervision	E	Followed established enterprise procedures.
C	The learner is working under general supervision with a high degree of autonomy	F	Met competency standard requirements
		G	Further training required

Learner's Signature ……..

Assessor's Signature ……..

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Enclosure A10 – Final/Challenge Test

A test may be required if the assessment process does not provide:

- sufficient, authentic or current evidence
- particular aspects of evidence related to equipment operation
- particular aspects related to safety
- all the requirements related to the influence of external bodies such as regulatory authorities

A final test should:

- cover the conditions associated with the 'Critical Aspects of Evidence' statement in competency standard units
- take into account the principles of assessment and be sufficiently rigorous
- be consistent with the policies and practices of the RTO providing the recognition.

Enclosure A11 – Contracted Entry Level Profiling Model – Sample assessment instruments that support a profiling model

The industry-preferred assessment model for Australian Apprenticeships involves longitudinal approaches to assessment activities that are considered more efficient and effective. This is best achieved by implementing a process of frequently gathering reliable data from the workplace by the learner and having it verified in a form that can be easily and consistently interpreted.

One option is to use a machine-readable data scan card or direct web entry process operating in conjunction with a computer software program. The design of the system, known as Profiling, reflects the key requirements outlined in the relevant competency standard units making up the competency development plan/program. Learners report directly on their exposure to required work experiences in a structured way. Additional to the off-the-job technical training required for contracted entry level learners, Profiling gathers specific workplace information reliably and systematically.

Data gathered frequently from the workplace accumulates over the competency development period and is reported graphically at given periods. This approach encourages self review and participation in the system, eliminates bias and minimises the effects of low levels of literacy (see below for an example).

The information gathered under Profiling, forms one component of a two part, in some cases three part, Training Program that supports competency development in a way preferred by the industry. The components are:

1. off-the-job training (technical subjects/topics)
2. on-the-job training (workplace activities)
3. a specific final 'safety systems (capstone)' test, where applicable.

Typically, the off-the-job component requires the successful completion of technical subjects/topics of training against essential knowledge and associated skills (EKAS) clauses included in the relevant competency standard units. Usually the EKAS are aligned to EKAS Knowledge and skills specifications that expand on the essential knowledge and associated skills clauses, providing more detailed information on depth and breadth of learning required to be delivered by RTOs. The on-the-job component requires that a profile be developed from workplace experiences/exposures. Finally, a specific safety assessment test is conducted, where applicable, for regulatory and industry requirements.

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On-the-job workplace data (experiences/exposures) is gathered for the required aspects of industry-determined competency standards, this data is then reported on relative to already developed industry norms. Typically the information gathered includes:

- activity measured against each element of competency against the performance criteria
- the range of equipment, processes, techniques and applications worked with/on in the workplace
- level of supervision of a learner's workplace experiences
- hours of exposure (recording hours only is not generally considered Profiling)

Data is entered against the prescribed criteria regularly (e.g. weekly) by the learner, the software program calculates the data against industry predefined norms and regular reports are produced (typically quarterly) for the use and information of RTOs, employers and the leaner. Assessors use this information in a holistic way to identify and analyse trends and anomalies against the predefined industry norms.
The advantages of electronic Profiling over other methods such as manually based log-books are that the computer does the extensive and laborious analysis that the assessor would otherwise have to do and that it is simple and directly reflective of the workplace experiences undertaken by the trainee. It provides evidence for:

- managing workplace skill development/ performance of competency to required standards
- progressive assessment and supporting the attainment of a national qualification
- the attainment of an electrical workers' licence/regulated registrations, where appropriate
- the need for job rotation
- allocating work
- RTOs without invasive and expensive worksite visits by none worksite staff

To gain an appreciation of what a data card and a report may look like a sample of each is included over the page.
Sample Data Card and Quarterly Report – provided below
Note: details of fields determined by Industry to accommodate enterprise requirements

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Sample Data Card

Certificate III Electrotechnology Systems Electrician

Week Number

Profiling Registration No. | Apprentice Surname | Apprentice Signature

SAMPLE ONLY

This week I :	Install support / protection	Install/terminate LV cables	Install Network comms cables	Test Apparatus / circuits	Install apparatus	Commission apparatus / circuits	Diagnose / rectify faults app/circuits	Maintain apparatus / circuits	Install explosion protected equip	Maintain hazardous area equip	Monitor energy usage	Install / maintain fluid m'ment equip	Electrical supporting activities	Off-job training attended (eg college)	Sick	Leave / RDO etc.	PASSED one module	PASSED half module
worked in the these areas	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Choose multiple combinations of hours — for approximately: up to 2 hrs	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
4 hours	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
8 hours	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
16 hours	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
32 hours	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
Choose one or more — and I: planned (ie interpreted diag etc.)	○	○	○	○	○	○	○	○	○	○	○	○						
carried out (ie conducted work)	○	○	○	○	○	○	○	○	○	○	○	○						
completed (ie compliance etc.)	○	○	○	○	○	○	○	○	○	○	○	○						
Choose one or more — whilst under: direct/constant supervision	○	○	○	○	○	○	○	○	○	○	○	○						
general/intermittant supervision	○	○	○	○	○	○	○	○	○	○	○	○						
broad supervision	○	○	○	○	○	○	○	○	○	○	○	○						

Hours

Cable/wiring support protection

- aerial ○
- cable tray/ladder ○
- catenary support ○
- metallic conduit ○
- non-metallic conduit ○
- trunking ○
- underground systems ○
- unenclosed support (eg. clips, saddles, ties) ○
- other ○

Apparatus

- control devices ○
- heating ○
- lighting ○
- protection devices ○
- socket outlets ○
- switchboards ○
- DC motors & controls ○
- single phase motors & controls ○
- synchronous motors & controls ○
- three phase motors & controls ○
- other ○

Power and control - LV cables

- armoured cables ○
- fire performance cables (eg. MIMS) ○
- signal cable (eg. shielded inst cable) ○
- special cables (eg. trailing cables) ○
- thermplastic insulated cable ○
- thermoplastic sheathed flat cable ○
- thermplastic sheathed circular cable ○
- other ○

Mandatory testing

- continuity ○
- insulation ○
- polarity ○
- correct connections (eg. switching as intended) ○
- isolation ○
- loop impedance ○

Other testing

- calibration ○
- leakage ○
- load current ○
- performance characteristics ○
- other ○

Network communications cables

- coaxial ○
- optical fibre ○
- structured (cat5/5+) ○
- patch cords ○
- telephone (cat3/4) ○
- other ○

Supporting work included :

- follow safety procedures ○
- use information systems ○
- protect the environment ○
- document activities ○

Tradesperson's signature verifies that the work was performed to an acceptable standard within an acceptable timeframe given the experience of the apprentice

Electrical Licence No: | Tradesperson's Surname | Tradesperson's Signature

*N.B. **Both** the Tradesperson's signature and Licence Number on the bottom of the card are **mandatory** - your signature means that you are simply checking that the work listed has been done. You are **not** assessing competency. There is no greater responsibility/obligation placed on the Tradesperson signing this card than there is currently under the Apprenticeship Act*

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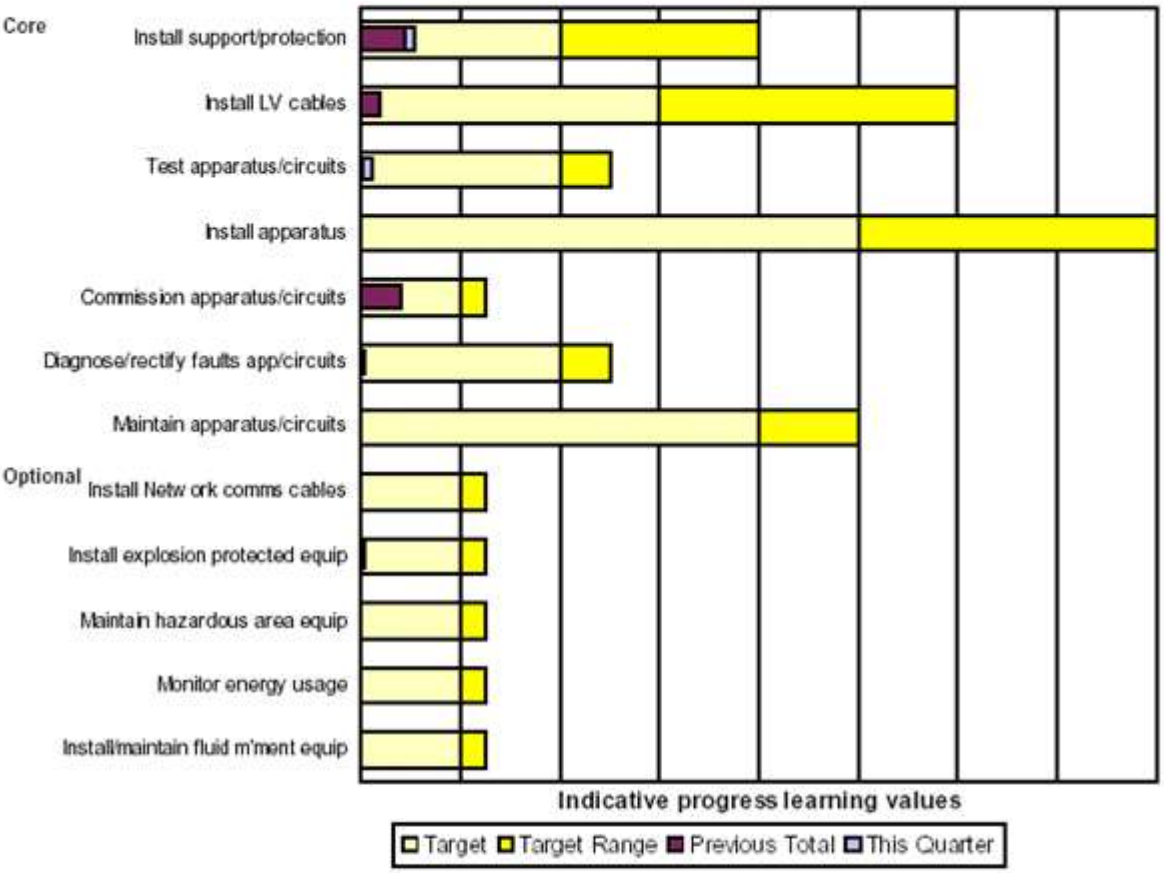
Sample Profiling Report

First Zzsample (999999)

Apprentice On Job Experience Profile - Progressive and Benchmarks Points

Systems Electrician - Quarterly Report, May 2002



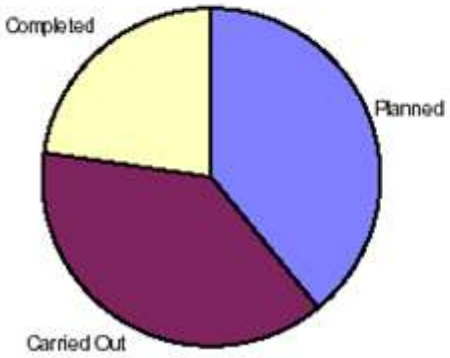
* indicates Optional competency selected by the learner in Schedule C

Apprentice Signature ..... Date .....

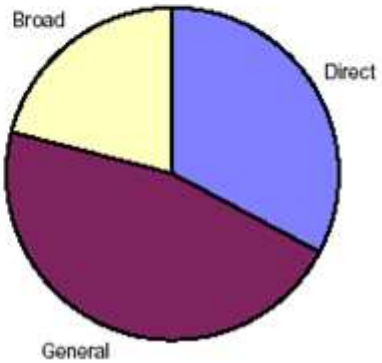
Employer Signature ..... Date .....

Host Signature (if applicable) ..... Date .....

Apprentice role



Supervision level



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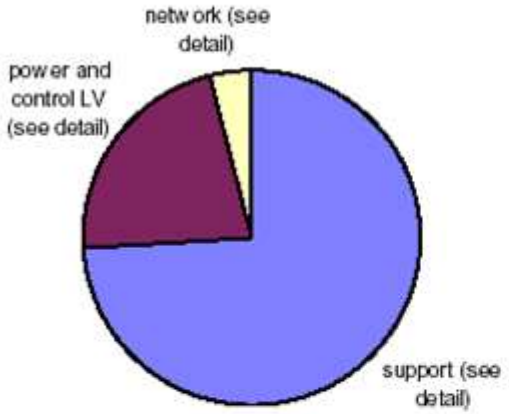
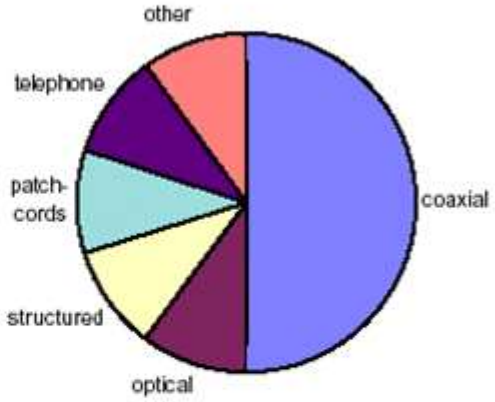
Sample Profiling Report (cont.)

First Zzsample (999999)

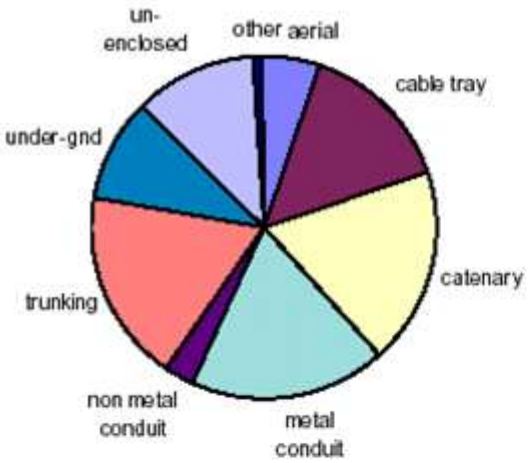
Electrical wiring system type



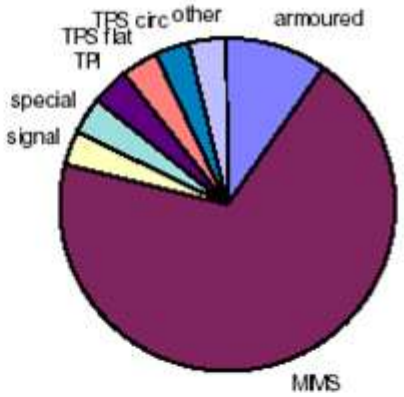
Electrical wiring detail: Network communications



Electrical wiring detail: Support and protection



Electrical wiring detail: Power & control - LV



Testing techniques used

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Appendix B – Enclosure B: Administrative forms

Enclosure B1 Notification of workplace assessment
Enclosure B2 Application for recognition of prior learning/ current competence
Enclosure B3 Assessee comment/feedback
Enclosure B4 Candidate's competency achievement report to a Registered Training Organisation

Enclosure B1 – Notification of workplace assessment

This form is used to notify a learner about their assessment. The learner is advised of the type of evidence being sought, the Competency Standard Unit(s) of competence being considered, who will be involved and the time and place of the activity.

Enclosure B2 – Application for recognition of prior learning/ current competence

Candidates should use this form to apply for recognition. The applicant needs to provide their personal details, the Competency Standard Unit(s) for which they seek recognition, the type of evidence being provided and the names of referees.

Enclosure B3 – Assessee comment/feedback

This form is used by the learner (or RPL applicant) to make comments about the workplace assessment process and/or decision. It should be distributed prior to an assessment being conducted. The workplace assessor should be sent a copy of each completed form and should retain these in case of any future review and/or inquiry.

Enclosure B4 – Candidate's competency achievement report to an RTO

This form summarises a workplace assessment process and allows workplace assessors to make recommendations to an RTO about deeming competence of a learner or RPL applicant.

Enclosure B1 – Notification of a Workplace Assessment

Learners Name: _____ Date of notification: / /
Assessors Name: _____ Tel: _____
Qualification Title: _____

The workplace assessment will be carried out on the following Competency Standard Units		**For the following reason (tick)**	
Unit No.	**Unit Title**	**Advice**	**Completion**

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Location _____ Date: / / Time: _____
Information has already been gathered from or is to be gathered from the following sources indicated below.

No	**Source of Information**		**Already Gathered (tick)**	**To be Gathered (tick**
1	**Work Activity Records** - experiences mostly relate to re-occurring workplace events.	Paper Based		
		Electronic		

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2	**Technical Results** (i.e. modules) – part of the program that develops your technical knowledge and skill		
3	**Portfolio** – personal and academic detail, employment and work achievements, references and the like		
4	**Self Analysis** – provides guidance on the type of evidence required and guides reference to other information		
5	**Item Range -** list of components, tools, systems, plant, test equipment, etc on which experience is gained		
6	**Supervisor's Report** - general comments about applying technical skills, being safe and productive		
7	**Soft Skills Report -** your ability to follow instructions, deal with clients and work in teams		
8	**Questioning -** covers issues related to your performance when planning, carrying out and completing work		
9	**Practical Demonstration -** a demonstration of your ability to perform tasks in a actual or simulated situation		
10	**Final Test** – evidence related to critical aspects of what is required by you to demonstrate competence		
11	**Other** (list)		

Note: Once all the information is collected and the data analysed the results about your progress towards or achievement of competence will be forwarded to you for your comments. If you require any additional information you should contact the assessor (above telephone number) or your nominated supervisor/mentor.

Name_____ **Signature** _____

Enclosure B2 – Application for Recognition of Prior Learning/ Current Competence

Name: _____Date of Birth: / /
Address: _____
Telephone: _____Mobile _____e-mail_____

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Recognition Sought _____
Training Package _____
Qualification No. and Title _____

Competency Standard Units (Candidate to List)

Unit Title	Unit No.

Evidence Provided

Type	Tick if Attached
Certificates	
Relevant work history	
Transcript of Academic Record – modules completed/equivalent	
References	
(other)	

Referees

Name	Organisation and Title of Referees	Contact Number of Referees

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Candidate's Signature: _____ Date: / /

Enclosure B3 – Assessee comment/feedback

To be completed by the candidate following an assessment event

Location: _____Date: ____/____/____Time: _____

•

Assessor's Name: _____

Please complete the following and return it to the Assessor.

Candidate's Name: _____
Contact N°: _____

I have read the Final Report for this assessment event and,
(tick)

Agree with the outcome. ☐
or

Disagree with the outcome. ☐

Comments:

_____

_____

_____

_____

_____

_____

_____

_____

Candidate's Signature: _____ **Date: _____/_____/_____**

Enclosure B4 – Candidates competency achievement report to RTO
This recommendation is made to (enter RTO name) _____

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It is recommended that (learner's name) _____ (contact and identification details) _____
_____ be attributed competence in the following Competency Standard Units.
These Units are from the Qualification (Title and No.)

Unit No.	**Competency standard unit Title**	**Assessors Initials**

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The recommendation was made based on analysed evidence taken from the following sources	**Tick**
Work Activity Records	
Knowledge and skills specification - Results	
Portfolio	
Self Analysis	
Item Range – Learner's Report	
Supervisor's Report	
Soft Skills Report	
Questioning	
Practical Demonstration	
Final Test	
Other (enter)	

Statement
The recommendation to attribute competence to the above mentioned individual is based on the evidence requirements outlined in Competency Standard Units from the _____ (Enter the Number and Title of the Training Package.)
Assessor's Name _____
Signature _____ **Date:** / /

Appendix B – Enclosure C Glossary of Terms

Definitions of all terms used in this section are set out below.

Term	**Definition/Explanation**
Appeal process	A process whereby the person being assessed or other interested party, such as an employer, may dispute the outcome of an assessment and seek reassessment.
Assessment	The process of collecting evidence and making judgements on whether competency has been achieved to confirm that an individual can perform to the standard expected in the workplace as expressed in the relevant endorsed industry/enterprise competency standards or

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Term	Definition/Explanation
	outcomes of accredited courses.
Assessment context	The environment in which the assessment will be carried out. This will include physical and operational factors, the assessment system within which assessment is carried out, opportunities for gathering evidence in a number of situations, the purpose of the assessment, who carries out the assessment and the period of time during which it takes place.
Assessment guidelines	Assessment guidelines are the endorsed component of a Training Package which underpins assessment and which sets out the industry approach to valid, reliable, flexible and fair assessment. Assessment guidelines include the assessment system overview, assessor requirements, designing assessment resources, conducting assessment and sources of information on assessment.
Assessment judgement	Assessment judgement involves the assessor evaluating whether the evidence gathered is valid and authentic, and whether there is sufficient and reliable evidence to make the assessment decision. The assessment judgement will involve the assessor in using professional judgement in evaluating the evidence available.
Assessment materials	Assessment materials are any resources that assist in any part of the assessment process. They may include information for the candidate, assessment tools or resources for the quality assurance arrangements of the assessment system.
Assessment plan	An assessment plan is a document developed by an assessor that includes the elements and Competency Standard Units to be assessed, when the assessment will occur, how the assessment will occur, the assessment methods to be used and the criteria for the assessment decision.
Assessment process	The assessment process is the agreed series of steps that the candidate undertakes within the enrolment, assessment, recording and reporting cycle. The process must suit the needs of all stakeholders and be both efficient and cost-effective. The agreed assessment process is often expressed as a flow chart.

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Term	Definition/Explanation
Assessment strategy	Assessment strategy means the approach to assessment and evidence gathering used by the assessor or RTO. It encompasses the assessment process, methods and assessment tools.
Assessment system	An assessment system is a controlled and ordered process designed to ensure that assessment decisions made in relation to many individuals, by many assessors, in many situations are consistent, fair, valid and reliable.
Assessment tool	An assessment tool contains both the instrument and the instructions for gathering and interpreting evidence: • Instrument[s] — the specific questions or activity developed from the selected assessment method[s] to be used for the assessment. A profile of acceptable performance and the decision making rules for the assessor may also be included. • Procedures — the information/instructions given to the candidate and/or the assessor regarding conditions under which the assessment should be conducted and recorded.
Candidate	A candidate is any person presenting for assessment. The candidate may be: • a learner undertaking training in an institutional setting • a learner/worker undertaking training in a workplace • an experienced worker wanting their skills recognised • any combination of the above.
Competency	The specification of knowledge and skill and the application of that knowledge and skill to the standards of performance required in the workplace.
Competency standard	Competency standards define the competencies required for effective performance in the workplace. Standards are expressed in outcome terms and have a standard format comprising of Unit title, Unit descriptor, Elements of Competency, Performance Criteria, Range Statement and Evidence Guide. See also Unit[s] of Competency.

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Term	Definition/Explanation
Competency standard unit	Also see Unit of Competency
Critical aspects of competency	A statement in a Unit of Competency that provides clear meaning as to what is to be achieved in the assessment process.
Currency of evidence	Evidence that is relevant to what is outlined in competency units and not outdated or irrelevant.
Dimensions of competency	The concept of competency includes all aspects of work performance and not only narrow task skills. The four components of competency are: • task skills • task management skills • contingency management skills • job/role environment skills.
Electronic Profiling	An innovative electronic based logbook system used by apprentices to record, and report on their workplace activities. A specially designed data entry card is used to capture work experiences (e.g. weekly) against industry approved competency standards and reported against industry-defined benchmarks. *See* Section 3.5 Assessment Processes within the Electrotechnology Industry and section Appendix A — Enclosure A11 Contracted entry level Profiling Model.
Element of Competency	The basic building block of the Competency Standard Unit. Elements describe the tasks that make up the broader function or job described by the unit.
Essential Knowledge and Associated Skills clauses	EKAS clauses provide the content specifications that must be achieved by learners in terms of the body of essential knowledge and associated skills.
Essential Knowledge and	EKAS knowledge and skills specification is specific learning content that is complete in itself and expands on the Competency Standard

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Term	Definition/Explanation
Associated Skills knowledge and skills specification	Units EKAS clauses in terms of depth and breath. It may underpin many, few or one Competency Standard Unit(s). It covers one or more aspects of knowledge and skills. An EKAS KKS can be separately delivered and assessed with percentage achievement reporting, and may be linked with other EKAS KKSs for delivery purposes in the same discipline area.
Evidence / quality evidence	Evidence is information gathered which, when matched against the performance criteria, provides proof of competency. Evidence can take many forms and be gathered from a number of sources. Assessors often categorise evidence in different ways for example: • direct, indirect and supplementary sources of evidence • evidence collected by the candidate or evidence collected by the assessor • historical and recent evidence collected by the candidate and current evidence collected by the assessor. Quality evidence is valid, authentic, sufficient and current. It enables the assessor to make the assessment judgement.
Evidence gathering techniques	Evidence gathering technique means the particular technique or method used to gather different types of evidence. This may include methods or techniques such as questioning, observation, third party reports, interviews, simulations and portfolios.
Evidence Guide	Evidence Guide is part of a Competency Standard Unit. Its purpose is to guide assessment of the unit in the workplace and/or a training environment. The Evidence Guide specifies the context of assessment, the critical aspects of evidence and the required or underpinning knowledge and skills. The Evidence Guide relates directly to the Performance Criteria and Range Statement defined in the Competency Standard Unit.
Fairness	See section 3.4.1 Assessment Principles
Flexibility	See section 3.4.1 Assessment Principles
Holistic /	An approach to assessment that covers the clustering of multiple

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Term	Definition/Explanation
integrated assessment	units/elements from relevant competency standards. This approach focuses on the assessment of a 'whole of job' role or function that draws on a number of units/elements of competence. This assessment approach also integrates the assessment of the application of knowledge, technical skills, problem solving and demonstration of attitudes and ethics.
Industry Skills Council/Industry Training Advisory Bodies (ITABs)	National bodies comprising representation from the industry parties responsible for the development, review, implementation, and providing advice on qualifications scopes and competency standards in given industries.
Module	A specific learning segment that is complete in itself. It deals with one or more aspects of knowledge and skills. A module is separately delivered and assessed and may be linked with other modules in the same study area and aligned to a competency standard unit(s).
Australian Apprenticeship Centre	An organisation that provides information on apprenticeships, traineeships and the related qualifications and processes.
Portfolio	See section 3.5 Assessment Processes in the Electrotechnology Industry.
Profiling	See section 3.5 Assessment Processes in the Electrotechnology Industry.
Performance Criteria	Evaluative statements which specify what is to be assessed and the required level of performance. The Performance Criteria specify the activities, skills, knowledge and understanding that provide evidence of competent performance for each Element Of Competency.
Qualification	Qualification means, in the vocational education and training sector, the formal certification, issued by a Registered Training Organisation under the Australian Qualifications Framework, that a person has achieved all the requirements for a qualification as specified in an endorsed Training Package or in an Australian Qualifications Framework accredited course where no relevant Training Package

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Term	Definition/Explanation
	exists.
Range Statement	Part of a competency standard, which sets out a range of contexts in which performance can take place. The range helps the assessor to identify the specific industry or enterprise application of the Competency Standard Unit.
Reasonable adjustment	The nature and range of adjustment to an assessment tool or assessment method which will ensure valid and reliable assessment decisions but also meet the characteristics and background of the person(s) being assessed.
Recognition **[Recognition of Prior Learning, Recognition of Current Competency and Skills Recognition]**	Recognition is a term applied to Recognition of Prior Learning, Recognition of Current Competency and Skills Recognition. These all refer to acknowledgement of competencies currently held, regardless of how, when or where the learning occurred. Under the Australian Recognition Framework, competencies may be attained in a number of ways. This includes through any combination of formal or informal training and education, work experience or general life experience. In order to grant recognition of prior learning/current competency the assessor must be confident that the candidate can present evidence that he or she is currently competent against the endorsed industry or enterprise competency standards or outcomes specified in Australian Recognition Framework accredited courses. The evidence may take a variety of forms and could include certification, references from past employers, testimonials from clients and work samples. The assessor must ensure that the evidence is authentic, valid, reliable, current and sufficient.
Records of assessment	The information of assessment outcomes that is retained by the Organisation that is responsible for issuing the nationally recognised Statement of Attainment or qualification.
Registered Training Organisation (RTO)	Registered Training Organisation (RTO) means a training organisation registered in accordance with the Australian Recognition Framework, within a defined scope of registration (see Scope of Registration).

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Term	Definition/Explanation
Reliability	See section 3.4.1 Assessment Principles
Sampling	See section 3.5 Assessment Processes in the Electrotechnology Industry.
Statement of Attainment	Statement of Attainment means a record of learning, recognised under the AQF, which although falling short of an AQF qualification, may contribute towards a qualification outcome, either as attainment of competencies within a Training Package, partial completion of an AQF accredited course leading to a qualification, or completion of a nationally accredited short course which may accumulate towards a qualification through Recognition of Prior Learning processes.
Sufficiency of evidence	See section 3.4.3 Assessment Judgments
Training Package	Training Package is an integrated set of nationally endorsed competency standards, assessment guidelines and Australian Qualifications Framework qualifications for a specific industry, industry sector or enterprise.
Training Agreement	An agreement outlining the training and assessment which forms part of an Australian Apprenticeship Training Contract and is registered with the relevant State or Territory Training Authority.
Training Plan	Training Plan means a program of training and assessment which forms part of an Australian Apprenticeship/traineeship Training Contract and is registered with the relevant State or Territory Training Authority.
Transcript of results — statement	List of candidate's modules/subjects/ EKAS knowledge and skills specifications completed as part of a Competency Standard Unit(s) or qualification.
Unit(s) of Competency /	Competency Standard Unit means the specification of knowledge and skill and the application of that knowledge and skill to the standard of

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Term	Definition/Explanation
Competency standard units	performance required in the workplace. Competency Standard Units define the outcomes for training delivery and assessment and lead to the issuing of Australian Qualifications Framework qualifications and Statements of Attainment. See also *Competency Standard*.
Validity	See section 3.4.1 Assessment Principles
Validation	Validation involves reviewing, comparing and evaluating assessment processes, tools and evidence contributing to judgements made by a range of assessors against the same standards. Validation strategies may be internal processes with stakeholder involvement or external validations with other providers and/or stakeholders.

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2.1.00 Preliminary Information and Glossaries

Electrotechnology Industry Standards UEE11

Volume 2 Part 1

Preliminary Information

This Volume (Vol 2 Part 1) contains the Definitions/Glossary of Electrotechnology Terms. In addition, the National Occupational Health and Safety Commission Glossary of Terms have been included. Users will find definitions here that clarify any Occupational Health and Safety specific terms. Where a term in the glossary is followed by a number, e.g. *Tools and equipment (2),* the number indicates the AQF level.
Volume 2, Part 2 contains competency standard units and the Essential Knowledge and Associated Skills (EKAS). Each competency standard unit has a reference to the relevant Knowledge and Associated Skills, which are detailed separately from the competency standard units. This is designed to make the package easier to interpret and apply. In the Essential Knowledge and Associated Skills section of each unit there is reference to the relevant EKAS, identified by a unique clause number and title. This separate Essential Knowledge and Associated Skills forms an integral part of each competency standard unit, and all assessment evidence activities and reporting processes are to incorporate this specification.

Training Package Layout

This revised Electrotechnology Industry Training Package has been developed, reviewed and validated through extensive industry consultation. It reflects the views of a wide cross-section of the industry and its key stakeholders/practitioners throughout Australia.
The Training Package has been constructed as a two volume set. Volume 1 covers the overall Package framework and completion requirements for qualifications. Volume 2 includes the content details of parts and sub-sections of Volume 1. The two volumes form an integrated whole and are not to be used independently of each other.

Volume 1

Preliminary Information

Current Membership of the National Steering Group
The Electrotechnology Industry

Part 1 Qualifications Framework
Part 2 Competency Standards Overview and Index
Part 3 Assessment Guidelines

Appendix A — Australian Apprenticeships
Appendix B — Sample Assessment Instruments
Enclosures

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- Enclosure A: List of Sample Assessment Instruments
- Enclosure B: Administrative Forms
- Enclosure C: Glossary of Terms

Volume 2

Preliminary Information

Part 1 Definitions/Glossary
Part 2 Competency Standards

2.1 Competency Standard Units

A – Assembly
B – Broadcast
C – Commercial
D – Computer systems
E – Cross discipline
F – Data and voice communications
G – Electrical
H – Electronic
I – Instrument and control
J – Refrigeration and air conditioning
K – Renewable and sustainable energy
L – Imported
M – Hazardous areas
N – Rail systems
P – Restricted and specialist
R – Research

2.2 Essential Knowledge and Associated Skills (EKAS)

Part 3 Literacy and Numeracy Skills

Volume 1: Structure and Overview

Part 1 – Qualification Framework

Information in Part 1 outlines how the qualifications are structured, along with their scope/descriptions, composition and content. Completion and issuance requirements are provided as well as advice on flexibility arrangements, with entry and exit pathways and articulation arrangements. Titles and codes of the list of qualifications to be issued are also included.

Part 2 – Competency standards

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Information in Part 2 outlines how the competency standards were developed (in broad terms). The industry coverage they apply to, as well as the format and construction of the individual competency standard units is provided. The index of Competency Standard Units and their scope/description is included in this part. Matters related to language, literacy and numeracy, access, equity and cultural diversity, and any regulatory arrangements, for which the competency standard units may apply is also included. Importantly, each competency standard unit is interrelated and linked with the Definitions/Glossary and Essential Knowledge and Associated Skills sections of the Volume. No competency standard unit is to be used in isolation or exported without these interrelated components.
There are nearly 500 competency standard units included in Volume 2, each listed according to their respective industry discipline area.

Part 3 – Assessment guidelines

Information in Part 3 outlines how the assessment guidelines inform RTOs about the infrastructure requirements they will need to enable them to carry out training delivery assessment activities related to the Training Package. This includes assessment systems, the role of the RTO, assessment pathways, recognition arrangements, assessor qualifications and sources of information.
Included in Part 3 are: Appendix A Australian Apprenticeships Application and Appendix B Sample Assessment Instruments. Appendix B also contains Enclosures A, B and C: A – a List of Sample Assessment Instruments, B – Administrative Forms and C – Glossary of Terms.

Volume 2: Competency standard unit's content and scope

Volume 2 Part 1 contains the competency standards units in their respective disciplines: Assembly; Broadcast; Commercial; Computer systems; Cross discipline; Data and voice communications; Electrical; Electronic; Instrument and Control; Refrigeration and air conditioning; Renewable and sustainable energy; Imported; Hazardous areas; Rail systems; Restricted and specialist; Research
Volume 2 Part 2.2 contains the Essential Knowledge and Associated Skills and an Essential Knowledge Matrix mapping the essential knowledge and associated skills to each Unit.
Volume 2 Part 3 contains information and definitions relating to literacy and numeracy skills. Users should refer to this section when developing learning and assessment resources.

Important Note to Users

Training Packages are dynamic documents. They are amended periodically to reflect the latest industry practices and are version controlled. It is essential that the latest version is always used.

Check the version number before commencing training or assessment

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This Training Package is Version 1 – check whether this is the latest version by going to www.training.gov.au and locating information about the Training Package. Alternatively, contact the Training Package developer and technical content custodian ElectroComms and EnergyUtilities Industry Skills Council Ltd trading as E-Oz Energy Skills Australia http://www.e-oz.com.au/ to obtain relevant content advice and confirm the latest version number.

Explanation of version number conventions

The primary release of a Training Package is Version 1. Sometimes when changes are made to a Training Package the version number is changed and sometimes it is not, depending on the extent of the change. When a Training Package is reviewed, it is considered to be a new Training Package and has a new Training Package number rather than a version change. Do not confuse the version number with the Training Package's national code (which remains the same during its period of endorsement).
Note the change of National Code from UTE99 to UEE11 for this Training Package.
In Volume 2, Part 2 the competency standard units and the Essential Knowledge and Associated Skills (EKAS) are found. The competency standard units refer to the Knowledge and Associated Skills in the relevant section of each competency standard unit. Just as the Definitions/Glossary section clarifies the Training Package use of terms the EKAS provides clarification as to the range and depth of coverage more briefly expressed elsewhere in the unit. Users should refer to these important requirements. The competency standard units themselves only refer to the clause number and reference title of the Essential Knowledge and Associated Skill the content of these clauses is found in Volume 2, Part 2.2.1. The separation of the essential knowledge and associated skills from the competency standard units has occurred to facilitate user friendliness for interpretation, applicability and future maintenance. This essential knowledge and associated skills forms an integral part of each competency standard unit and all assessment evidence activities and reporting processes are to incorporate this specification.

Definitions and OHS Glossary

The definitions and glossary in this Part are included to provide further elaboration of the meaning of particular words, phrases and terms used in the Training Package, especially in the competency standards units.

Scope

The Competency Standard Units in this Part of the Training Package cover the Electrotechnology Industry. The definitions provided in the Definitions/ Glossary are those that are to apply to the use of those terms within the Training Package. They are included to provide added clarity of the term and are the meanings generally understood and used by Industry; the regulators, and the community of practitioners.

Application

The information contained in each competency standard unit includes the intended use of the unit for assessment and a training program(s).

References

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Regulations
The work functions described by competency standard units in this Training Package may be subject to statutory regulations. Where this is the case the particular regulations will depend on local jurisdictions and knowledge and application of such regulations within the scope of the unit shall be an aspect of evidence in deeming a person competent. Refer to in 1.4 Definitions

Reference documents
Each part of the Training Package will include a list of reference documents. These are a component of competency which assist in developing training programs and assessing competency, which include relevant legislation, regulation, industrial instruments, codes of practice, guidelines and advisory standards and policies. Examples may include industry preferred training and assessment models, anti-discrimination and equal employment opportunity statutes encompassing application of access, equity and cultural diversity principles associated with under-represented groups. They should be used wherever required and currency is to be assured in their application.

Definitions – Electrotechnology

The definition of terms used in this Part 2 of the Training Package form an integral part of the Training Package.

1.4.1 Access permits
A form type document giving formal permission to enter a specified work area when it is safe to do so and is part of the risk control measures for the area.

1.4.2 Accessories
Devices forming part of an electrotechnology system or installation but not including those defined as apparatus

1.4.3 Apparatus
Any device used to convert energy from one form to another and any device used for control or protection of a person, environment or a system.

1.4.4 Appliance
An energy using device, other than a lamp, in which electricity and/or gas is converted to any other form of energy.

1.4.5 Appropriate person

Individuals with responsibilities for design, installation, maintenance, production or servicing activities or a customer or a person of higher authority.

Note: Examples of an appropriate person is a site manager, a project manager, a line manager, a supervisor a team leader and a customer's representative.

1.4.6 Approved
Acceptable to an authority having jurisdiction

1.4.7 Assessment of competence
The process of checking and confirming demonstrated performance in carrying out specified work activities and/or functions based on evidence that shows a person has carried out such work safely and to requirements.

1.4.8 Australian Qualifications Framework (AQF)

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Australian Qualifications Framework Qualifications described in terms of levels characterised by the outcomes of vocational education and training. The Australian Qualifications Framework is intended to provide a comprehensive, nationally consistent, flexible framework for all qualifications in post-compulsory education and training.

1.4.9 Australian Quality Training Framework (AQTF) / Standards for NVR Registered Training Organisations 2012

A set of nationally agreed Standards to ensure the quality of vocational education and training services throughout Australia. The AQTF and the Standards for NVR Registered Training Organisations 2012 includes Standards detailing:

Standards for Registered Training Organisation
Standards for State and Territory Registering/Course Accrediting Bodies

1.4.10 Authorised

Permission granted by a relevant higher authority to use particular equipment or to carry out specified work.

1.4.11 Authority

Agency representing the interest of another party and with the responsibility to make decisions on their behalf.

Note.
Examples are a customer's representative and agencies responsible for implementation of legislation

1.4.12 Cardiopulmonary Resuscitation (CPR)

An emergency life-support procedure using a combination of expired air resuscitation and external cardiac compression.

1.4.13 Checks, functional

The process of verifying that items of equipment operate as intended. Functional checking is used confined to basic systems.

1.4.14 Checks, visual

The process of identifying defects that is apparent to the eye. Visual checking is used confined to basic systems.

1.4.15 Competency

Competency comprises the specification of knowledge and skills and the application of that knowledge and skill to the standards of performance required in the workplace. Competency includes all aspects of work performance and not only narrow skills. The four components of competency are: task skills; task management skills; contingency management skills and job/role environment skills.

1.4.16 Competency Standard Unit(s) See also units of competency

A competency standard unit is the group of skills and knowledge required by an individual to carry out a useful work function. Description of Units of Competency is given in Section 2 of this Standard.
A single Competency Standard Unit is not to be confused with a job description that will invariably comprise of a number of competency standard units.

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Competency standards are made up of a number of Competency Standard Units. These units describe a key function or role in a particular job function or occupation. Each unit identifies a discrete workplace requirement and includes the knowledge and skills that underpin competency, as well as language, literacy and numeracy and Occupational Health and Safety requirements. A competency standard unit is usually linked to one or more AQF qualifications.
The fields in each competency standard unit and the types of information they contain are given in Table 1.1 below.

TABLE 1.1 Field Titles in a Competency Standard Unit and the types of information they contain

Field Title	**Type of information**
Unit code	**Unit title**
Unit Descriptor	1.1) Scope General description of the scope of the work function to which the competency applies and the general abilities needed. 1.2) License to Practice Indicates how technical standards, codes of practice and regulatory requirements apply to the Unit and whether a licence to practise is required.
Prerequisite Units	2) Prerequisites 2.1) Competency Standard units Specific and general competencies expected to have been achieved prior to undertaking training in the unit. 2.2) Literacy and numeracy skills Informs the reading, writing and maths skill level needed to achieve competence in the unit. (see Volume 2 Part 3).

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Field Title	Type of information
Employability Skills	**3)** Generic competencies related to enabling skills for workplace employment activities
Application of the unit	4) Application The way in which the Unit is intended to be used in a learning program or qualification
Competency field	5) Discipline The sector of the electrotechnology industry to which the unit mainly applies.
Elements and Performance Criteria	6) Elements Outcomes that contribute to a unit. Performance Criteria Specify the required levels of performance for each Element.

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Field Title	Type of information
Required skills and knowledge	7) Essential knowledge and associated skills Knowledge that is either explicit or implicit for effective performance.
Range Statement	8) Range Range of context and conditions to which performance criteria apply.
Evidence Guide	9) Evidence guide Assists with the interpretation and assessment of the unit
Overview of assessment	9.1) Overview Provides a summary of appropriate assessment methods and what they encompass.
Critical aspects of evidence required to demonstrate competency in this unit	9.2) Critical Aspects of Evidence Particular knowledge and skills essential to effective performance.
Context and specific resources for assessment	9.3) Context Environment and resources acceptable for assessing achievement of competency. Informs of the resources needed when simulating real the work place is considered and indicates when simulation of the workplace may be a viable or necessary.
Methods of assessment	9.4) Assessment Methods Indicates the acceptable methods of assessment which are specified in Section 3 of this document.
Concurrent assessment and relationship with other units	9.5) Concurrency Identifies where benefits may be derived by assessing two or more units concurrently or sequentially.

- **1.4.17 Competency Standards**

  Competency Standards are the collection of competency standard units for a particular industry sector and are an integral part of a Training Package.

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The competency standard units described in this document are part of the Electrotechnology Industry Training Package UEE11.

- **1.4.18 Complex**

  Made up of many interrelated parts the behaviour or performance of which affect the behaviour or performance of the whole.

Note. Examples in the context of electrotechnology are systems with many interworking subsystems, complex work activities such as some testing procedures and aspects of some essential knowledge.

- **1.4.19 Compliance**

  An installation or equipment that conforms to relevant regulations which may include technical standards, codes or practice and the like.

- **1.4.20 Computer system**

  Computer hardware, software and connectivity components that make up a system to operate, control or analysis a process.

- **1.4.21 Consistent performance**

  Relates to sufficient evidence being present. This requires evidence that competence has been demonstrated for each element of each unit having been achieved at least twice; autonomously and to requirements.

- **1.4.22 Defects**

  Physical or performance aspects of an installation or equipment that do not comply with the relevant regulations, standards or job specifications.

- **1.4.23 Documentation**

  Written information, either hard or soft copy, related to a work function.

Note. Examples of documentation are forms, work instructions, specifications, drawings, reports

- **1.4.24 Electrical installation, general**

  All parts of an electrical installation in a building, structure and premises that are not designated as special electrical installations or those related to hazardous areas.

- **1.4.25 Electrical installation, special**

  Electrical installation related to moveable premises and caravan parks, shows and carnivals, boating marinas, medical treatment areas, cranes and hoists, lifts, electric fences and construction and demolition sites.

- **1.4.26 Electronic sub assemblies**

  An assembly of connected electronic components designed for a particular function that forms part of an electronic apparatus or system.

- **1.4.27 Enterprise standards**

  Standards of management, performance, service or product established by an enterprise.

- **1.4.28 Endorsement**

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The variations in equipment or function in which an individual demonstrates competence relevant to a competency standard unit. An endorsement applies to competency standard unit in the disciplines of 'Hazardous areas' and 'Restricted and special electrical work' and is shown by a suffix to the unit title. Details of endorsements are given in the competency standard units where they apply

- **1.4.29 Equipment**

  Any component part or apparatus accessory of an electrotechnology system or installation

- **1.4.30 Established procedures**

  Formal arrangements of an organization, enterprise or statutory authority of how work is to be done and by whom.

Note. Examples of established procedures are documented in quality management systems, safety management systems, work clearance systems, work instructions, work procedures, standard operating procedures, reporting systems and arrangements for dealing with emergencies.

- **1.4.31 Essential knowledge and associated skills (EKAS) knowledge and skills specification (KKS)**

  Provide specific advice in facilitating consistency and reliability in resource development and delivery. The knowledge and skills specifications are premised on the separate content of the essential knowledge and associated skills section of the expanded Volume 2 - Essential Knowledge and Associated Skills clauses, which are referred to in each competency standard unit.

The specifications are designed to:

- provide the depth and breadth of essential knowledge and associated skills to be learned
- ensure they support the needs of the workplace
- contain assessment strategies, including a table of specifications to increase validity, reliability and fairness
- detail the resources required for satisfactory delivery in the learning environment
- provide clarification regarding the type and quantity of evidence needed for assessment purposes
- support a variety of delivery modes, e.g. face-to-face, distance or computer- assisted learning
- provide content and structure that maximises learning retention
- provide a clear purpose statement about their relationship to the overall educational program.

- **1.4.32 Established routines**

  Strict procedures for carrying out a work activity or task often formalised in the form of work instructions.

- **1.4.33 Explosion protection**

  Techniques applied to the design of electrical equipment, components and systems to prevent the electrical energy from becoming an ignition source in the presence of flammable vapours and gases or combustible dusts in hazardous areas.

- **1.4.34 Fall prevention**

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Safe working practices intended to prevent persons or objects from falling from a height regarded as hazardous.

- **1.4.35 Hazard**

  Something with the potential to cause injury or disease to persons, damage property or disrupt productivity.

- **1.4.36 Hazardous area**

  Area in which an explosive atmosphere is present or may be expected to be present in quantities such as to require special precautions for the construction, installation and use of electrical equipment. Hazardous areas may include a variety of adverse environmental conditions such as those encountered in coal mines, shipping, oil/gas platforms and the like, which commonly require further specifications stated in legislation or regulatory requirements.

- **1.4.37 Hazardous area records**

  Records that show a hazardous area has been appropriately classified and the electrical equipment complies with the appropriate certification and other relevant requirements specific to the site. Generally referred to as a 'Verification Dossier'

- **1.4.38 Industry standards**

  Standards of management, performance, service or product established by a representative Industry Body. This Training Package is an example of an industry standard.

- **1.4.39 Inspection, actions taken**

  Actions taken by an inspector in relation to defects in an installation

Note: Examples of such actions are disconnection or non-connection of supply until a defect is rectified, notice of the period in which it has to be rectified, other actions within the scope of inspection authority.

- **1.4.40 Inspection, audit**

  An inspection that reviews the regulatory obligations of enterprise. Audit inspections may involve reviewing records of work, inspection of safety equipment and inspection of recently completed work.

- **1.4.41 Inspection, close**

  An inspection which encompasses those aspects covered by a visual inspection and, in addition, identifies those defects, e.g. loose fasteners, which will become apparent when access equipment, e.g. steps, and tools are used. Close inspections do not normally require an enclosure to be opened or equipment de-energised.

- **1.4.42 Inspection, detailed**

  An inspection that encompasses those aspects covered by a close inspection and, in addition, identifies those defects that only become apparent when an enclosure is opened up, or by use of tools and test equipment.

- **1.4.43 Inspection, visual**

  An inspection that identifies, without the use of access equipment or tools, those defects that are apparent to the eye.

- **1.4.44 Install**

  1. The act of placing and permanently fixing equipment in place in a building or premises.

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2. Placing and setting up an operating system and application software on a computer or network.

- **1.4.45 Installation**

  Installation includes all equipment and component parts or a system as they are fixed in place and connected as necessary, to operate as intended.

Note. Examples of installations are antenna installations, electrical installation, home entertainment installations and refrigeration installation.

- **1.4.46 Key competencies**

  Generic competencies enabling effective participation in work and their incorporation in the Units of Competency (see Appendix A).

- **1.4.47 Knowledge and Skills Specification (KKS)**

  See Essential Knowledge and Associated Skills (EKAS).

- **1.4.48 Maintain**

  Ensuring systems, equipment or apparatus continue to work properly by checking, repairing faults, rectifying malfunction and making adjustments as required.

- **1.4.49 Maintenance, scheduled**

  A formal process of periodically checking, overhauling and replacing equipment and/or components based on the assessment of risk associated with their failure during operation.

- **1.4.50 Non-compliance**

  Aspects of an installation or equipment that do not satisfy the applicable regulations, standards or requirements.

- **1.4.51 OHS policies and procedures**

  Arrangements of an organization or enterprise to meet its legal and ethical obligations of ensuring the workplace is safe and without risk to health. (See also Glossary of OHS Terms)

Note: Ensuring a workplace is safe will include hazards identification and risk assessment mechanisms, implementation of safety regulations, safety training, safety systems incorporating work clearance procedures, isolation procedures, use of protective equipment and clothing and use of codes of practice.

- **1.4.52 Permit, clearance to work**

  A system that authorises, in writing, specified work activities to be carried out in a specified work location at a specified time as part of the risk control measures. The system includes safety procedures that shall be followed before authorisation is given.

Note. Examples include work permit systems operate in the electricity supply sector, in petrochemical plants, in refineries, in heavy manufacturing and in rail networks

- **1.4.53 Process control**

  Control of actions used in the manufacture, analysis and modification of materials.

- **1.4.54 Process control system**

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System used to control processes

- **1.4.55 Regulated environment**

  Are those requirements that are to be met for regulated purposes including but not limited to licensing regimes; registration regimes; industrial instruments and/or arrangements; standards; codes of practice; industry wide preferred approaches encompassing industry polices and guidelines advised for respective Training Package non-endorsed implementation.

- **1.4.56 Reporting**

  Formally written or computer entered and stored document detailing the outcomes of a work activity. (See 1.4.15 Documentation)

- **1.4.57 Requirements**

  That to which equipment and procedures and their outcomes shall conform and includes statutory obligations and regulations and Standards called-up by legislation or regulations; or manufacturers', regulatory or industry requirements
  Requirements may include codes of practice, industry policies, job specifications, Australian/New Zealand or International Standards called up in specifications be they - conformity notices, procedures and work instructions, and quality management systems, as well as transport documentation, manufacturers' specifications, maintenance manuals, schedules and specifications/standards, circuit/cable schedules, design specifications, customer/client requirements and specifications and national and state guidelines, policies and imperatives relating to the environment

- **1.4.58 Representative range**

  That which requires a sufficient body of evidence undertaken across a range of activities and work functions to be present in order that a valid, reliable, fair and timely judgement about an individual's performance for attributing competence can be made. The range of systems, apparatus, equipment, accessories, applications, processes, and/or techniques referred to in the unit should be such that a peer group of industry practitioners would readily conclude that competency has been demonstrated. See competency standard unit for more information and in relation to the body of evidence required refer to the Assessment Guidelines of this Training Package.

- **1.4.59 Risk assessment**

  Process of evaluating the likelihood and consequences of occurrences that would have an adverse affect on safety, health and the environment of a work area and the operation and viability of an enterprise.

- **1.4.60 Risk control measures**

  Methods and equipment for preventing risk of injury or damage from a hazard. Many risk control measures have been established and formalised in standards and codes of practice.

- **1.4.61 Safe design principles**

  Principles applied in the design of a product that take into account means to reduce harmful affects to both persons and the environment during its manufacture, its use and its disposal at the end of the life of the product.

- **1.4.62 Safe working**

  System of procedures used to ensure safety in work and operation related to rail systems.

- **1.4.63 Servicing**

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Maintaining, fault finding / troubleshooting and repair of equipment, plant machinery and/or installations**.**

- **1.4.64 Set-up**

  Place in operation equipment that requires certain procedures to be followed before it can be used. Typical items of equipment that require setting up are appliance, computers and home entertainment equipment.

- **1.4.65 Simulation**

  Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Note:
Six principles have been developed to govern the conduct of assessment in simulated environments; however, the underpinning principle in relation to off-the-job workplace simulation is that "actual tasks, activities and conditions are as close as possible to real life situations": 1. Reflect workplace conditions, 2. Reflect the intent of the Electrotechnology Training Package, 3. Involve Realistic and Authentic Activities, 4. Facilitate Profiling, 5. Support Holistic Judgements, and 6. Undergo Quality Assurance Processes.

- 1**.4.66 Skills enabling employment**

  A range of genetic employment based skills that are expected of individuals in a workplace. (See Volume 2 Part 5)

- **1.4.67 Specifications**

  All those attributes that define accurately the nature of the involved hazards, materials/products, processes, equipment and installation design.

Note:
Examples of specifications are design and manufacturer specifications defining all the necessary parameters and tolerances, process flow diagrams, explosive characteristics and technical data sheets for hazardous materials and products.

- **1.4.68 Standard, deemed to comply**

  A guide setting out methods and materials that if applied in the prescribed way will satisfy the requirements of a performance-based technical standard.

- **1.4.69 Standards, technical**

  Technical documents which set out specifications and other criteria for equipment, materials and methods, to ensure they consistently perform as intended. The Standards referred to are **those published by Standards Australia or an industry association.**

- **1.4.70 Sustainable energy, practices**

  Working in a way that eliminates unnecessary energy use and material waste and disposes of the necessary waste with minimal effect on the environment and in compliance with regulation.

- **1.4.71 Training Package**

  A Training Package is a set of nationally endorsed Standards and qualification for recognising and assessing people’s skills. A training package specifies the outcome of training and is not a prescription of how an individual should be trained.

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- **1.4.72 Unit of competency**
  See competency standard unit.
- **1.4.73 Vocational standard**
  See competency standard unit.
- **1.4.74 Voltage, extra-low**
  Not exceeding 50 V a.c. or 120 V d.c.
- **1.4.75 Voltage, high**
  Exceeding low voltage
- **1.4.76 Voltage, low**
  Exceeding extra-low voltage, but not exceeding 1000 V a.c. or 1500 V d.c.
- **1.4.77 Work instructions**
  Strict and formal instructions on how a work activity or task is to be carried out.
- **1.4.78 Work platform**
  Equipment specifically designed to access a work area out of normal reach above the ground or floor level.

Note. Examples are step ladders, extension ladders, scaffolding, pole platforms, 'cherry pickers' and the like.

- **1.4.79 Workplace procedures**
  See 1.4.29 Established procedures
- **1.4.80 Work site protection**
  Processes and procedure to manage or prevent the passage of trains over a section of (rail) track for which possession has been acquired so that maintenance or repair work can be carried out.

Additional Glossary terms for Occupational Health and Safety

Introduction
This Glossary of Occupational Health and Safety (OHS) Terms has been developed to assist competency developers and writers, reviewers of training packages and those developing any training specification or learning materials for the Vocational Education and Training Environment.

In Australia we consider that the rate of workplace fatality, injury and ill-health is far too high. To reduce this toll we need to make some changes in the workplace and this requires training to enable enterprises and workers to effectively manage safety.
We must ensure that OHS is clear in the competency so that the resultant learning contributes to improving the capacity of those in the workplace to manage safety. This applies not only to the 'designated' OHS units but to the integration of OHS, as appropriate, into all competencies, learning programs and learning resources.

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The competency, TAADES505A *Research and develop competency standards*, specifies the outcomes and the knowledge and skills required to research and develop documents which outline competency requirements for a particular job function, work process, work role or specific vocational outcome. This competency cites four phases in developing a competency:

1. Research the competency area
2. Formulate competency specifications
3. Validate competency specifications
4. Finalise competency specifications.

OHS is a critical aspect of research into the competency area, and also an important aspect of work performance to be integrated within a competency.

To some extent OHS has is its own language. OHS is 'owned' by many people as it impacts on all of us, however key words and terms are not always used in a consistent manner and this can lead to confusion. To maximise the effectiveness of our training and education we need to ensure that our use of the OHS language is as consistent and clear as possible.

This glossary is not intended as a definitive dictionary of OHS terms but is designed to be used in the second phase of competency development which is to formulate the competency specifications. It is also an invaluable tool for those involved in the design and development of learning resources.

Further information on OHS hazards, practical guidance material, standards and codes of practice is available at the National Occupational Health and Safety Commission website at www.nohsc.gov.au

The glossary is intended to be an evolving and dynamic document and those wishing to comment on the terms or suggest additions or modifications should email the Team Leader of the OHS Skills Development Team at NOHSC.

GLOSSARY OF OHS TERMS

NOHSC Glossary	Explanation
Accident	A term that is now considered out of date. Preferred term is 'incident'.
Accountability	The process by which a person with OHS responsibilities is answerable to a higher authority.
Action level	The level at which a risk is considered to be unacceptable and action is required to reduce the level of risk. May be specific such as a noise level at which hearing protection must be worn, a concentration of chemical or more generic.
(OHS) Action plans	Documented plans developed within the workplace to implement OHS management, which include allocated responsibilities and time frames.

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NOHSC Glossary	Explanation
Administrative controls	Management practices that aim to control employees' exposure to specific hazards, and generally improve health and safety – examples include the use of job rotation, job enlargement
ALARA (As Low As Reasonably Achievable)	A basic concept where risks are kept as low as is reasonably achievable. ALARA is determined by reference to established codes and standards and consultation with groups impacted by the decision outcomes including those exposed to the risk.
Anthropometry	The science dealing with the comparative measurement of the size and proportions of the human body, the range of movement of limbs, as used in ergonomics.
(OHS) Audit	A systematic examination against an agreed benchmark of the approach to managing safety to evaluate an organisation's arrangements for identifying hazards, assessing and controlling risks, and monitoring and improving the effectiveness of the management of OHS and compliance. (Note a workplace inspection is NOT an audit.)
Audit tools	The instruments for collecting evidence and conducting the analysis and evaluation (they are not the same as the audit criteria or benchmark), they may be: • developed specifically for the purpose • adapted from existing tools • purchased or accessed from existing tools • and include: • performance checklists • sets of questions to be asked • descriptions of required characteristics to be checked • limitations for and instructions for use
Authorisation of permit	Signing of permit by competent person.
Biomechanics	The application of mechanics (forces and motion) to analyse body movement and the stresses involved in body posture during movement.
Causative event	Key event that resulted in the particular outcome(s) of injury or damage.
Circumstance	Short-term situation that is relatively unusual, such as a storm or when a key person is absent.

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NOHSC Glossary	Explanation
Certification	Refer ‘operator certification.
Common law	Law that is derived from the English legal system and has evolved through judicial decision and practice (case law) that establishes and follows precedent. Note difference to ‘statute law’.
Condition	Permanent situation such as type of equipment, work practice, design of work environment (often different to detect or identify) that may contribute to risk.
Consequence	The injury or damage outcome of an event, which may be expressed quantitatively or qualitatively; there may be a range of possible outcomes for a specific event or scenario.
Confined space	An enclosed or partially enclosed space which- • is at atmospheric pressure during occupancy • is not intended or designed primarily as a place of work, and is liable at any time to - • have an atmosphere which contains potentially harmful levels of contaminant • not have a safe oxygen level or • cause engulfment, and • may have restricted means for entry and exit. A confined space is determined in part by the hazards associated with a defined set of circumstances (restricted entry or hazardous atmosphere, risk of engulfment) and not just with work performed in a restricted space. Examples include but may not be limited to: storage tanks, tank cars, process vessels, boilers, pressure vessels, silos and other tank-like compartments open-topped spaces such as pits or degreasers pipes, sewers, shafts, ducts and similar structures shipboard spaces entered through a small hatchway or access point, cargo tanks, cellular double bottom tanks, duct keels, ballast and oil tanks and void spaces (but not including dry cargo holds). A person is deemed to have entered a confined space when their head (i.e. the breathing zone) or upper part of the body is within the boundary of the confined space. (Note that inserting an arm for atmospheric testing is not considered an

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NOHSC Glossary	Explanation
	entry to a confined space). References**:** • AS/NZS 2865:2001 Safe working in a confined space • Handbook - HB 213:2003 Guidelines for safe working in a confined space
Consultative arrangements	State and territory OHS legislation specifies obligations for workplace consultation. The workplace arrangements to meet these obligations may include: • OHS and other consultative and planning committees • health and safety and other employee representatives • employee and supervisor involvement in OHS activities such as inspections and audits • procedures for reporting hazards, and raising and addressing OHS issues • employee and workgroup meetings. Factors that should be considered when developing consultative arrangements include: • language • shift work and rostering arrangements • timing of information and data provision • literacy and numeracy levels • workers with special needs • workplace organisational structures (for example, size of organisation, geographic, hierarchical) • cultural diversity • management approach • workplace culture and approach to OHS by managers, supervisors and employees.
Controls	The devices and methods of controlling the effect of the hazard so that the risk of injury is minimised. The ‘quality’ of the control is the level and reliability of the control compared with the level of risk. The quality of the controls is determined by: • the best available technology or approach should be applied when the most probable outcome is death or serious injury • the best practical technology or approach may be applied where the most probable outcome is less serious Refer also ‘Hierarchy of control’.

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NOHSC Glossary	Explanation
	Workplace factors that impact on the controls selected and the implementation include*:* • language • shift work and rostering arrangements • literacy and numeracy • workplace organisational structures (e.g. geographic, hierarchical) • cultural diversity • training required • workplace culture related to OHS, including commitment by managers and supervisors and compliance with procedures and training.
Control measures	Devices, systems (including work methods) or approaches that reduce exposure to workplace hazards

Crisis management plan

A flexible document that can cope with a broad range of crisis types and:

- is approved at the highest levels of the organisation
- focuses on management control
- identifies responsibilities for decision making
- details communication processes and psychological support
- addresses arrangements with any contractors or shared tenancy
- integrates the emergency response plans as well as recovery
- incorporates dealing with external agencies and support
- addresses planning for recovery before crisis occur.

Documentation for crisis management plan may include

- policy, emergency response structure, initial response instructions for various roles/areas, responsibility and authority of individual roles, warning systems, training requirements, resource inventory for response and recovery, program review and monitoring processes; and
- crisis risk management documentation, such as risk management team lists, communications strategies, identification of issues, risk assessments/evaluations, vulnerability profiles, risk registers and treatment strategies.

The term ‘emergency management’ may also apply but ‘crisis management’ infers a more holistic approach encompassing

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NOHSC Glossary	Explanation
	the full range of business affairs.
Dangerous *Goods (DG)*	Those gases, liquids and solids identified and classified under the internationally agreed system which is followed in Australia and that are subject of so called 'dangerous goods' standards and legislation. The objective of the Dangerous Goods legislation is to control the storage, handling and transport of DGs to protect the safety of workers, the public, property and the environment. While dangerous goods may also be hazardous the terms should not be confused.
Dangerous parts of plant	Potential contact or entrapment points to which the operator may be exposed during: • operation • examination • lubrication • adjustment • maintenance.
Design	The process of bringing together innovation, aesthetics, and functionality to plan and create a product, processor system to meet the artistic, industrial or performance requirement of an individual or group. The Design Process involves a series of activities where an idea is conceived, shaped, developed, produced and then acted upon to produce a designed-product. It also includes any subsequent alteration of a designed-product (redesign or retrofit).
Design process	The stages of the design process include: The concept design phase considers preliminary design options, which are assessed against product specifications to determine the best preliminary design to be developed. This phase includes concept design, research and development, feasibility and risk management (including OHS risks). The detailed design phase develops the selected design to its final state. It includes research and development, feasibility studies, concept and detail design, technical and functional specifications, plans and drawings, operational systems, construct/manufacture options and detailed quantities, cost and risk analysis (including analysis of OHS risks).
Designed-product	The item to be designed, including a built environment, structure, an item of plant or equipment, chemical, work system or process; or any other physical attribute or system

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NOHSC Glossary	Explanation
	associated with either the work or its interface with people.
Duty of care	Arises from common law but is enshrined in OHS statute law and / that places into a legal form a moral duty to anticipate possible causes of injury and illness and to do everything reasonably practicable to remove or minimise these possible causes of harm. The key factors relating to duty of care are that: • duty of care applies wherever there is special relationship (employer – employee, employer-contractor, supervisor – work team member, tradesperson-apprentice) • duty of care applies to all circumstances of the relationship • individual duty of care cannot be delegated (but roles and functions may be delegated) • applies personally to individuals • applies to all risks that are foreseeable and preventable • includes the concept of 'reasonable'.
Elements of systematic approaches to managing OHS including OHSMSs	A list of key requirements or major principles that are combined in a methodical and ordered manner to minimise the risk of injury or ill health in the workplace; and may include processes of OHS planning, allocation of resources, communication and consultation, hazard management, record keeping and reporting, training and competency, and review and evaluation for ongoing improvement of OHS.
Emergency	Events such as: • serious injury events • emergencies requiring evacuation • fires and explosions • hazardous substance and chemical spills • explosion and bomb alerts • security emergencies, such as armed robberies, intruders and disturbed persons • internal emergencies, such as loss of power or water supply and structural collapse • external emergencies and natural disasters, such as flood, storm and traffic accident impacting on the organisation. May also be referred to 'hazardous event'.
Emergency agency	Includes fire, police, ambulance, relevant government departments, hazardous materials response teams (HAZMAT)

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NOHSC Glossary	Explanation
	and OHS authorities
Emergency control organisation (ECO) is:	Structured group within the organisation that includes roles such as emergency controller, communications recorder, media liaison and employee support.
Emergency equipment	Includes: • first aid equipment • eye wash shower or portable eye washes • fire extinguishers and equipment • communication equipment • evacuation alarms • evacuation equipment, especially that for disabled persons • torches • clothing items such as coloured hats and vests.
Emergency stops and warning devices	Are fitted to plant and equipment that have a risk of entrapment or other hazard and must be: • prominently, clearly and durably marked • coloured red (push buttons, bars or handles) • unable to be affected by electrical or electronic circuit malfunction • fitted where risk assessment identifies a need.
Enforcement	Processes and instruments available to the OHS regulator under legislation may include*:* • prosecution • prohibition notices • improvement notices • on-the-spot fines • provisional improvement notices.
Epidemiology	The study of the distribution and determinants of disease within human populations. Patterns of injury or illness in groups of people are studied to determine causes, identify groups at risk and to identify and evaluate methods of treatment and prevention.
Ergonomics	The study of the relationship between people, the equipment they use and their physical and social work environment.
Ergonomic interventions	Includes: • design of tools • design of workplaces

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NOHSC Glossary	Explanation
	• design of products • design of equipment • design of work systems, processes or organisation including work flow, planning and control • job design • development of new decision making processes • new forms and organisations of work
Ergonomic tools and databases	May include: • engineering models • Australian and International Standards • Australian and International anthropometric databases
Explosive substance	Substance that explodes if it comes into contact with heat, flame, an ignition source or incompatible substance.
Fail-to-safe	Design feature of equipment that ensures if there is a failure or defect in the product, or another factor such as loss of power, then the product is left in a safe condition.
Functional areas and management systems	Other than OHS but that impact on the management of OHS may include: strategic planning purchasing, procurement and contracting logistics HR, IR and personnel management, including payroll engineering and maintenance information, data and records management finance and auditing environmental management quality management.
Guarding	Devices fitted to machinery to separate the operator from dangerous parts of the machine. Devices may include: • permanently fixed physical barriers where no access of any part of a person is required • interlocking physical barriers where access to dangerous areas is required during operation • physical barriers securely fixed by means of fasteners or

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NOHSC Glossary	Explanation
	devices • presence-sensing safeguarding systems.
Hazard	A source or a situation with a potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these.
Hazards of long latency	Conditions, illnesses and other health risks that result from longer term exposure to specific triggers such as chemicals, noise, radiation and psychosocial factors.
Hazards of low frequency/high consequence	High impact events that occur rarely such as explosions, fires and building collapses but may result in very serious injury, death or multiple death situations.
Hazard identification	The process of identifying sources of harm. Hazard identification may be required: • at design or pre purchase of buildings, equipment and materials • at commissioning or pre-implementation of new processes or practices • before new forms of work and organisation of work are implemented • before changes are made to workplace, equipment, work processes or work arrangements • as part of planning major tasks or activities, such as equipment shutdowns • following an incident report • when new knowledge becomes available • at regular intervals during normal operations • prior to disposal of equipment, buildings or materials. Different methods may be used to identify hazards including observation; consultation with workers, clients or other users; trial of models or prototypes; review of technical standards and other information sources; monitoring and measurement.
Hazard identification tools and processes	Include: • analysis of incident investigations • analysis of incident, injury and claims statistics • workplace inspections • job safety analysis (JSA) • audits • cause and effect diagrams • surveys

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NOHSC Glossary	Explanation
	• review of research and industry literature
Hazardous event	Includes incidents with the potential to seriously harm life, health, property, the environment or a combination. May also be referred to as ‘emergencies’.
Hazardous substance	A substance that is listed on the National Commission’s *List of Designated Hazardous Substances* (NOHSC:10005) or has been classified as a hazardous substance by the manufacturer or importer in accordance with the National Commission’s *Approved Criteria for Classifying Hazardous Substances* (NOHSC:1008).
Hazardous substance register	Listing of all the hazardous substances that are used or produced in a workplace together with a current Material Safety Data Sheet for each substance. May also contain risk assessments for individual hazardous substances.
HAZCHEM	An initial response emergency action code that provides information vital to emergency services to enable them to stabilise the incident scene during the early stages of a HAZMAT incident. The Code is displayed on emergency information panels on transport vehicles and on signs on buildings. HAZCHEM codes are assigned to chemicals on the basis of their flammability, toxicity, reactivity and other relevant chemical and physical properties.
HAZMAT	A contraction of the words 'hazardous materials' and may be used in a range of circumstances including HAZMAT emergency response units, HAMAT emergency response equipment and HAZMAT registers of hazardous substances.
HAZOP (Hazard and Operability Study)	An advanced risk analysis technique that involves a systematic review of a process to determine risks and risk minimisation strategies.
Health and safety representative	An employee, elected by the workgroup, who represents the OHS interests of the people with whom they work. The function is carried out in addition to the normal work role. Processes for election of health and safety representatives, their role and rights are specified in state and territory legislation.
Health promotion	The promotion of health, especially as a workplace program, designed to improve and enhance employee health undertaken as a complementary activity to the prevention of work-related injury and disease.

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NOHSC Glossary	Explanation
	Also called wellness.
Health surveillance	Monitoring or checking individuals for the purpose of identifying changes due to exposure to hazards in the workplace. May include biological monitoring.
Hierarchy of control	The priority order in which hazard and risk controls should be considered with the eventual outcome often being a combination of measures. The prime emphasis is on: • elimination, and where this is not practicable, minimisation of risk by: • substitution • isolating the hazard from personnel • engineering controls • administrative controls (e.g. procedures, training) • personal protective equipment (PPE).
Hot work	Involves using equipment that generates heat, sparks, flames or any other sources of ignition in an atmosphere that may be flammable. Includes work with welders, cutters including oxygen cutters, power tools, grinding, mobile phones. Hot work can also include breaking into 'live' equipment or performing work on live equipment that has the potential to release its contents (e.g. hot tap in chemical plants).
Housekeeping	Describes workplace and personal routines designed to improve hygiene and safety, for example, cleaning up spills and keeping walkways, exits and traffic areas clear.
Incident	An event that has caused or has the potential for injury, ill-health or damage. ('Incident' is the preferred term rather than 'accident')
(Sources of OHS) Information*:*	May be internal and include: • hazard, incident and investigation reports • workplace inspections • incident investigations • minutes of meetings • Job Safety Analyses (JSA's) and risk assessments • organisational data such as insurance records, enforcement notices and actions, workers compensation data, OHS performance data • reports and audits • material safety data sheets (MSDSs) and registers

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NOHSC Glossary	Explanation
	• employees handbooks • employees including questionnaire results • OHS advisors • manufacturers' manuals and specifications. Or external, including: • regulatory bodies and OHS Acts regulations, codes and guidance material • other relevant legislation • National Occupational Health and Safety Commission (NOHSC) and Australian Bureau of Statistics • databases such as national and state injury data and NICNAS (National Industrial Chemicals Notification and Assessment Scheme) • OHS specialists and consultants • newspapers and journals, trade/industry publications • internet sites • industry networks and associations including unions and employer groups • OHS professional bodies • research information.

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NOHSC Glossary	Explanation
Isolation	A safety device system that includes devices such as isolating switches, locks, safety bars, shields, full pressure blanks, spectacle blanks to lock controls, especially moving parts, equipment, systems or devices with stored energy, to an 'off' position while a worker is in a vulnerable position such as carrying out maintenance on rotating equipment, and electrical and hydraulic systems. Isolation systems generally use locking switches that need keys to open the lock and are used in conjunction with a danger tag system that promotes greater safety consciousness amongst the workforce for all situations in which danger to persons could arise from: • the operation of machinery, plant or equipment • the flow of steam, electricity, gases or liquids • the use of faulty or unsafe plant and equipment • include multiple locking systems and involve written authorisation by a competent person Also called 'lock-out' and 'tag-out'.
Job Safety Analysis (JSA)	Process of examining all aspects of a task to identify hazards and conditions with a potential for injury or ill health with the objective of developing risk controls including written job instructions.
Legislation relevant *to OHS*	Includes Commonwealth and relevant State / Territory OHS specific acts and regulations as well as: • workers compensation • privacy legislation • contract law • trade practices • criminal law • common law • industrial relations law • equal employment opportunity and anti- discrimination law
Life-cycle	All phases in the life of a product. Specific phases depend on the type of product but may include design, development, manufacture, construction, assembly, import, supply, distribution, sale, hire, lease, storage, transport, installation, erection, commissioning, use or operation, consumption, maintenance, servicing, cleaning, adjustment, inspection, repair, modification, refurbishment, renovation, recycling,

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NOHSC Glossary	Explanation
	resale, decommissioning, dismantling, demolition, discontinuance, disposal.
Likelihood	The likelihood of the occurrence of the consequence, not the likelihood of the hazard or the particular scenario.
Locked out	Equipment, which is not to be operated for any reason, may be pad-locked or otherwise prevented from operation using a keyed lock. A lockout may be accompanied by a tag out, or a lock out system may incorporate a tag. Lockout means the isolation by a mechanical device, generally a lock, which, when applied at the source, physically prevents the control to any electrical or mechanical equipment being turned on. Refer also to 'Isolation'.
Manual handling	The use of force applied by a person to lift, move, carry, push, pull or otherwise move or restrains an animate inanimate object.
Material Safety Data Sheet (MSDS)	Document describing the properties and hazards of a material or substance including statements about its chemical and physical properties, health hazards, precautions for use and safe handling instructions. All manufacturers and suppliers of chemicals are obliged to produce an MSDS for each hazardous chemical.
Monitoring	Involves the use of valid and suitable techniques to estimate the exposure of employees to a hazard.
Musculoskeletal disorder (MSD)	An injury, illness or disease that arises in whole or part from manual handling in the workplace, whether occurring suddenly or over a prolonged period of time. (Does not include injuries caused by crushing, entrapment or cut resulting primarily from the mechanical operation of plant.
Occupational Overuse Syndrome (OOS)	Previously called RSI and refers to arrange of conditions characterised by persistent discomfort and pain in and around joints and associated with repeated movement of the joint. Recent state and territory legislation tends to group these conditions with those arising from manual handling as Musculoskeletal Disorders.
OHS inspection	The process of physically examining and evaluating the extent to which hazards and risks exist, and /or particular OHS requirements, procedures or standards are being met.

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NOHSC Glossary	Explanation
	Refer also to 'workplace inspection'.
OHS specialists	Include: • safety professionals • ergonomists • occupational hygienists • safety engineers • injury management advisors • health professionals.
Operator certification	The process by which a certificate to use or operate industrial equipment is issued by a certifying authority.
OHS management system (OHSMS)	That part of the organisation's overall management system that covers developing, implementing, reviewing and maintaining the activities for managing OHS. It is NOT a standard, a commercial package or folders on the shelf; however it may involve use of OHS management systems developed in the workplace to meet the OHS situation in that particular workplace. Also referred to in broader context as systematic approaches to managing OHS.
Operational controls for plant and equipment	Should: • be suitability identified • have nature and function clearly indicated • be readily and conveniently located • be guarded to prevent unintentional activation • be capable of locking in 'off' position to enable disconnection of all motive power and forces • be of 'fail safe' type.
Participative arrangements	Are those arrangements that inform employees and other stakeholders of OHS matters, seek their input and offer opportunity for stakeholders to participate in decisions that may impact on their OHS. May also be referred to as 'consultative arrangements', however 'participation' implies a higher level of involvement.
Permit to work	A written authority document such as hot work and confined space entry that: • includes approval to undertake work and activities including tests, measurements and monitoring • is authorised by a responsible or designated person

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NOHSC Glossary	Explanation
	directly in control of the work • certifies appropriate precautions and controls to be followed • incorporates checklists, conditions and actions such as the frequency and duration of the work and atmospheric tests • follows recognised industry standard recording practices.
Plant	As defined in National Standard for Plant includes: • machinery, equipment (including scaffolding), appliance, implement or tool and any other component, fitting or accessory • fixed and or specified plant as cited in commonwealth, state and territory OHS legislation • mobile plant and load shifting equipment • pressure equipment such as boilers, pressure vessels and pressure piping • electrical installation and plant such as wiring, accessories, fittings, consuming devices, control and protective gear, converters and generators.
Plant Registration	The administrative process by which a certifying authority or state OHS regulator requires an organisation or industry to register plant, machinery and equipment.
Personal protective equipment (PPE)	Equipment designed to be worn by a person to provide protection from hazards, and may include: • head protection • face and eye protection • respiratory protection • hearing protection • hand protection • clothing and footwear. Personal protective equipment is considered the least satisfactory control measure.
Policies and procedures	Relevant to OHS include: • policies and procedures underpinning OHS including those for hazard and incident reporting, OHS communication, consultation, issue resolution and risk management • quality system documentation • purchasing and contracting procedures • documents describing how tasks, projects, inspections,

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NOHSC Glossary	Explanation
	jobs and processes are to be undertaken • standard operating procedures, work instructions • job or batch sheets, recipes • operators manuals • employee and contractor handbooks • job/task statements.
Positive performance indicators	Focus on assessing how successfully a workplace is performing through measuring OHS processes.
(OHS) Records	Requirements for OHS record keeping may be defined in: • OHS legislation and regulations governing reporting of incidents and maintenance of records related to specific hazards, including chemical registers and material safety data sheets (MSDSs) • privacy legislation • organisational procedures. OHS records may include: • hazard and incident reports, first aid records • risk assessments • hazardous substances and dangerous good registers, MSDSs • risk registers • OHS audit and inspection reports • maintenance and testing records • OHS training records • outcomes of health surveillance and environmental monitoring • workers compensation claims and return to work records. OHS records must be stored taking account of: • privacy • confidentiality • enabling access to personal records, within legislative requirements • commercial in confidence issues as appropriate.
(OHS) Reporting requirements	Under legislation include serious injury and serious incident reporting to OHS authorities.
(OHS) Responsibilities	Those with legislated OHS responsibilities include: • company director

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NOHSC Glossary	Explanation
	• manager • supervisors • OHS representatives • employees and contractors • designers, manufacturers, installers, suppliers.
Residual risk	That risk that is unable to be designed out of a product or process.
Risk	The chance of something occurring that will result in injury or damage. It is measured in terms of consequences (injury or damage) and likelihood of the consequence. Refer also to 'Consequence' and 'Likelihood'.
Risk analysis	Analysing the risk to: • identify factors influencing the risk and the range of potential consequences • effectiveness of existing controls • likelihood of each consequence considering exposure and hazard level • combining these in some way to obtain a level of risk. Factors influencing the risk may be associated with • equipment • work environment • work organisation • task • the individual/operator • frequency and duration of exposure • number of people exposed/ involved.
Risk assessment	Risk assessment is a two-step process that involves risk analysis and risk evaluation. Risk assessment as required under various OHS legislation does not necessarily require this second step of evaluation. Refer also to 'Risk Analysis' and 'Risk evaluation'.
Risk evaluation	Comparison of risk with pre-established criteria for tolerance (or as low as reasonably achievable) and the subsequent ranking of risks requiring control. This activity will usually be carried out by or in conjunction with others with advanced OHS skills and knowledge.
Risk management	The whole systematic process directed towards identifying

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NOHSC Glossary	Explanation
	hazards, assessing the risk and developing controls to minimise the risk and monitoring the effectiveness of the controls (and taking further action as required).
Risk ranking	A process of rating risks according to their severity and likelihood. Common systems are based on matrices or nomograms but are usually highly subjective.
Risk register	Includes: • a list of hazards, their location and people exposed • a range of possible scenarios or circumstances under which these hazards may cause injury or damage • the results of the risk assessment, and may also include; • possible control measures and dates for implementation. May also be referred to as Hazard Register.
Safe Design	A design process that generates options to eliminate hazards, or minimise potential risk to health and safety of those who make the product and those that use it by involving decision makers and considering OHS risks throughout the life cycle of the designed product.
Stakeholders	In workplace OHS include: • managers • supervisors • health and safety and other employee representatives • OHS committees • employees and contractors • the community.
Standards	Relevant to OHS include: • OHS regulations and standards developed by OHS regulators • national standards (NOHSC) • Australian standards • International national standards • industry standards • codes of practice • exposure standards • guidance notes.
Statute Law	Law created by legislation passed by government (acts and regulations) as distinct from common law.

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NOHSC Glossary	Explanation
(OHS) plan:	A document that: • is usually developed annually but may be developed for a shorter or longer period • reviewed regularly • has OHS performance indicators (i.e. objectives and targets that are achievable and practical) reflecting systematic approaches to managing OHS.
System of work	The overall process of work including: • method by which the work is carried out • organisation of the work • selection and maintenance of tools and equipment • supervision and training • selection of workers • allocation of tasks and responsibilities.
Systemic approach to managing OHS	Requires: • comprehensive processes that are combined in a methodical and ordered manner to minimise the risk of injury or ill health in the workplace • processes of planning, allocation of resources, communication and consultation, hazard management, record keeping and reporting, training and competency, and review and evaluation for ongoing improvement. Factors that may impact on the implementation of a systematic approach to managing OHS may include: • barriers to communication, such as language/literacy • workplace culture issues, such as management commitment, supervisors' approach to compliance and general acceptance of the priority of safety • diversity of workers • structural factors, such as multiple locations, shift work and supervisory arrangements.
Tag out	Refer to 'Isolation'.
Technical advisors	To the OHS function may include: • legal practitioners • engineers (such as design, acoustic, mechanical, civil) • security and emergency response personnel • workplace trainers and assessors • maintenance and trade persons.

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NOHSC Glossary	Explanation
Wellness	Refer to 'Health promotion'.
Workplace policies	Comprise written statements of employer's intentions and how the employers will action those intentions in the workplace. For example: OHS, access and equity, discrimination and manual handling.
Workplace inspection	Process of examining the workplace, usually with the aid of a checklist, to identify hazards and level of compliance with workplace procedures.

Some terms in the glossary have been taken from, or modified from the CCH Occupational Health and Safety Glossary, 1992 and National Guidelines for Integrating OHS Competencies into National Industry Competency Standards [NOHSC: 7025 (1998)] 2nd edition.

Volume 2 Part 2

Competency Standard Units

In this Electrotechnology Training Package (UEE11) there are approximately 500 competency standard units, arranged into sixteen (16) disciplines for ease of presentation and to facilitate quick access and referencing for users.

Disciplines

A – Assembly

B – Broadcast

C – Commercial

D – Computer systems

E – Cross discipline

F – Data and voice communications

G – Electrical

H – Electronic

I – Instrument and control

J – Refrigeration and air conditioning

K – Renewable and sustainable energy

L – Imported

M – Hazardous areas

N – Rail systems

P – Restricted and specialist

R – Research

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All of the competency standard units have been developed in accordance with DOI minimum requirements and include minor enhancements. All Parts in Volume 2 of this Training Package form an integrated component of each competency standard unit and must be included when developing learning strategies and assessment processes. Importantly, competency standard units interrelate and are linked with both the Definitions/Glossary and an Essential Knowledge and Associated Skills (EKAS) sections of the Volume. Each competency standard unit includes its unique combination of EKAS by clause number and title

EKAS have been separated from the competency standard units to facilitate user friendliness for interpretation, applicability and future maintenance, however the EKAS section forms an integral part of each competency standard unit and all assessment and reporting processes require the confirmation of the achievement of the relevant EKAS specifications.

No competency standard unit is to be used in isolation or exported without these interrelated components.

For detailed information on competency standard units, including their structure, refer to *Volume 1, Part 1 Qualifications* and *Volume 1, Part 2 Competency Standards.*

Coding Structure

The competency standard units have been coded with a Discipline code. Units in any one Discipline may range across a number of AQF levels. Refer to the section covering the Qualification Structure of Volume 1 Part 1 Qualification Framework to determine the relevant unit(s) pertaining to the qualification(s) required.

Unit Number										
U	E	E	N	E	E	H	0	2	4	A
Industry - EE-Oz Training Standards identifier			Training Package identifier			Discipline ← letters →	Unit Numbers 001 to 999			Version
← 12 Characters Maximum →										

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U = Utilities – DOI Identifier
EE = E-Oz Energy Skills Australia – ElectroComms and EnergyUtilities Industry Skills Council Identifier
N = National – Training Package identifier
EE = Electrical and Electronics
H = Discipline (e.g. H = Electronic)
Number = unit number identifier
A = Version

Possible Skills Set CSUs

Some competency standard units (CSUs) may appear within this section and/or within a qualification of this Training Package but they can be delivered and assessed independently of any qualification.
Typically, these CSUs relate to work functions associated with regulatory or specialised functions. They may augment or be incidental to existing competencies held by individuals or be required for workplace entry associated with OHS issues.
All identified prerequisite requirements must be met for each competency standard unit.
The independent competency standard units are listed in Volume1 Part 1 – Qualifications Framework. For the complete competency standard unit refer to the respective Discipline sections.

Essential Knowledge and Associated Skills

Introduction

The Essential Knowledge and Associated Skills (EKAS) are an integral part of each unit of competence and must be taken into account when developing learning strategies and assessment tools. The EKAS inform delivery to assure consistency, reliability and validity of outcomes. Following are the EKAS industry has determined as necessary for the development and deeming of competence.

Outline of Essential Knowledge and Associated Skills construction

As particular EKAS can be common across several units the Electrotechnology Industry has adopted a system of Clause Numbering and has allocated Clause Titles, these are mapped into each unit of competence in Section 7.1. The numbers and titles have been grouped into Topics that are indicative of the EKAS content for ease of use. Clause Numbers for this Training Package begin with 2 followed by a decimal that refers to the Topic area as shown below.

Clause number	Topic areas
2.1	Cables, conductors and terminations
2.2	Common, commercial, processes and enterprise specific knowledge

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and skills

2.3 Control technologies

2.4 Communications and computer technologies

2.5 Drawings, diagrams, schedules, manuals, standards and regulations

2.6 Electrical applications and apparatus

2.7 Electrical installations and systems

2.8 Electrical principles

2.9 Electronic principles and applications

2.10 Electronic communications technology

2.11 Equipment and tools

2.12 Instrumentation

2.13 Maintenance and repair

2.14 Rail signalling

2.15 Refrigeration and air conditioning apparatus

2.16 Refrigeration and air conditioning installations

2.17 Refrigeration and air conditioning principles and applications

2.18 Safety

2.19 Special requirements

2.20 Sustainable energy and environment

2.21 System, control and automated

2.22 Hazardous areas

ESI-Transmission Distribution and Rail Training Package

T2.4 HV Switching

Refer Volume 2 - Part 2.2 Essential Knowledge and Associated Skills (EKAS)

Essential Knowledge and associated Skills to Unit Maps

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The following appendices of the Electrotechnology Training Package consist of two mappings of the Essential Knowledge and Associated Skills:

- Appendix 1 - Competency Standard Units to Essential Knowledge and Associated Skills Relationship
- Appendix 2 - Essential Knowledge and Associated Skills to Competency Standard Units Relationship

This information is provided to assist users in developing holistic training support materials for respective qualifications and/or competency standard units.

Appendix 1 and 2

Refer to Appendix 1 - Unit to Essential Knowledge and Associated Skills Relationship and Appendix 2 - Essential Knowledge and Associated Skills to Unit Relationship

2.2.00 EKAS Contextualisation

EKAS Contextualisation

In some competency standard units there are 'notes' to specific content. These notes add value and clarity to the content. The notes may augment the scope, performance criteria, range statement, essential knowledge and associated skills or other related sections of the Competency Standard Unit.
The insertion of these 'notes' is primarily to provide users and support material developers with examples of the form and type related to technical content principles, technology, equipment, or processes that may be considered to be the range and depth of the outcomes. As the type, form, process, or technique of technology and equipment may change it is the responsibility of RTOs to continue to be current in the content of their delivery.
It is therefore prudent for RTOs to consider the 'notes' in relation to their delivery and assessment.
As with the units generally where contextualisation of the 'notes' varies the outcome of a competency standard unit RTOs should consult with E-Oz Energy Skills Australia to explore options for incorporating and/or covering the new arrangements so that currency of the Training Package is maintained.
It should be noted that any need to alter the competency standard units from its intended outcome requires a new or varied competency standard unit. Such changes are to be undertaken through the continuous improvement processes required of Training Packages, which in relation to this Training Package is managed by E-Oz Energy Skills Australia.

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2.3.1 Reading, Writing and Numeracy

VOLUME 2 PART 3

3.1 LANGUAGE, LITERACY AND NUMERACY

The reading, writing and numeracy skills/competencies in each competency standard unit describe the recommended prerequisite entry requirements typically needed to successfully achieve competence in the unit. A nationally-recognised language, literacy and numeracy framework has been used to provide advice as to the relevant entry level required.
The information has been derived from the '*National Reporting System*' report, '*A mechanism for reporting outcomes of adult English language, literacy and numeracy programs*'. The Australian National Training Authority (ANTA) and the Department of Employment Education and Training (DEET), 1994-5, jointly funded the report. Australian Training Products Ltd (ATP) distributes it for and on behalf of Language Australia Victorian Office. Stock code 3010A, ISBN: 0 7306 7493 2, April 1999.
The report:

- identifies adult English language, literacy and numeracy competencies in industry
- facilitates student pathways
- generates ideas for curriculum and assessment

The report identifies a national framework of five vertical levels of competence related to complexity of language, literacy and numeracy competence. Six interrelated horizontal aspects of communication were found to apply in relation to differing orientations of social activity involving reading, writing, speaking, listening and/or numeracy. These were categorised as follows: Procedural Communication for performing tasks; Technical Communication for using technology; Personal Communication for expressing identity; Cooperative Communication for interacting in groups; Systems Communication for interacting in organisations; and Public Communication for interacting in the wider community.
The National Reporting System Report: A mechanism for reporting outcomes of adult English language, literacy and numeracy, should be referred to at all times for clarification, more detailed information and advice.
For the purposes of providing relevant entry-level advice, specific features of writing, reading and numeracy competencies have been selected from the five-level competence structure using the Technical Communication aspect of the national framework, these are outlined in the Table below. Registered Training Organisations should use this information to assist them in developing appropriate entry-level learning strategies, to assist learners meet the entry-level requirements of specific competency standard units.

Table 1 – Reading, Writing and Numeracy \-– Indicators of Competence

These five levels of competence are interrelated with six aspects of communication of the National Reporting System (NRS). The NRS suggests that the '*report of a person's competence derives from the interplay between the chosen activity, the features of the text/task, and the context and level of support under which the activity is performed*'.

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Note: These indicators of competency are not an assessment system and not a recruitment instrument for employers. They are not a curriculum; not a model of language acquisition; not a means for categorising students in terms of a simple 'level'; not a set of 'broad' competency statements, but specific to reading writing and numeracy.

Reading

Scale	IoC*	**Indicators of Competence**	**Technical Communication**
5	5.1 5.2 5.3	Reads and interprets structurally intricate texts in chosen fields of knowledge and across a number of genres, which involve complex relationship between pieces of information and/or propositions. Interprets subtle nuances, infers purpose of author and makes judgements about the quality of an argument. Reads and critically evaluates texts containing data which includes some abstraction, symbolism, and technicality presented in graphic, diagrammatic, formatted or visual form.	Defines the purpose and objectives for the use of a particular technology, e.g. writes a report, which includes a detailed analysis of technology as, applied in a particular workplace or environment. Draws on prior knowledge of the application of technology in researching the capacity of a new system, e.g. writes a briefing and recommends purchase or use of a particular system. Uses technological principles to reduce constraints presented by environmental or physical capacity, e.g. writes a report, which compares the effectiveness and efficiency of manual and computerised record management systems. Prepares a written or oral report, which critically evaluates the content, structure, and purpose of technical texts including graphic, diagrammatic or numerical information. Adapts task instructions to suit changes in technology, e.g. writes plain English instructions for the operation of a new machine based on the manufacturer's instructions. Draws from a number of sources and uses computer skills to prepare a report, e.g. CV and job application letter.
4	4.1 4.2	Reads and interprets structurally intricate texts in chosen fields of knowledge which require integration of several pieces of information for generating meaning. Interprets texts, which include ambiguity, and inexplicitness where	Compares and contrasts views on technology in newspaper articles. Interprets the purposes and objectives for the use of technology after the reading a brochure or manual. Selects technological practices to conform

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Scale	IoC*	**Indicators of Competence**	**Technical Communication**
		reader needs to distinguish fact from opinion and infer purpose. Interprets and extrapolates from texts containing data which includes some abstraction, symbolism, and technicality presented in graphic, diagrammatic, formatted or visual form.	to the guidelines for health and safety, environmental impact and ethical practice, and uses them within those guidelines. Uses guidelines to ensure technological equipment is used to its full capacity. Uses a computer to prepare a typed report from a hand-drafted report. Compares and contrasts different technologies and their impact, e.g. argues the case for new practices when using new technologies, reports on the effects of installation of new machinery. Writes a report on the impact of a particular technology for a specific audience, e.g. management committees, tri-partite committees. Reads a complex diagram to identify components and procedures for dealing with a technical fault or breakdown.

Reading – continued

3	3.1 3.2 3.3	Reads and interprets texts of some complexity, integrating (where relevant) a number of pieces of information in order to generate meaning. Displays awareness of purpose of text, including unstated meaning. Interprets and extrapolates from texts containing data which is unambiguously presented in graphic, diagrammatic, formatted or visual form.	Reads a technical manual where the information is supported by diagrams, sufficiently well to be able to locate and comprehend particular information required, e.g. programs a VCR to record two programs in advance. Uses the author, title, key word and other search indexes of a library computer. Comprehends short summary information on computer-managed learning packages to choose a relevant package to suit own needs. Uses the word processing program on a computer to produce texts. Writes simple instructions for using familiar technology, e.g. how to use an automatic teller machine. Completes a formatted workplace test, e.g. damage or breakdown report. Writes a brief report on uses of technology,

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			e.g. for classroom, workplace, domestic or community purposes.
2	2.1 2.2	Reads and interprets short simple texts on a personally relevant topic. Locates specific information relating to familiar contexts in a test which may contain data in simple graphic, diagrammatic, formatted or visual form.	Reads short, relevant, explicit, clearly formatted texts related to technology, e.g. the author and title index of a library computer. Chooses a computer assisted learning package, having read short descriptions of one or two programs, to acquire a defined skill or area of knowledge. Writes a short description, e.g. describes a damaged part of a machine to facilitate repair. Extracts information from a list with language and numeracy components, e.g. price lists of components for computer systems. Records simple and routine information using the telephone, e.g. takes a phone message, on a form designed for this purpose. Interprets instructions, which combine pictorial and written information, e.g. directions on how to operate a piece of machinery safely.
1	1.1 1.2	Reads and identifies letter of the alphabet in the context of whole words, numbers, signs and symbols relating to personal details and immediate environment. Identifies specific information in a personally relevant text with familiar content, which may include personal details, location or calendar information in simple graphic, diagrammatic, formatted or visual form.	Recognisees very short, explicit, pictorial texts, e.g. understands logos related to worker safety before using a piece of machinery, reads letters on a keyboard. Reads graphic instructions accompanying a new piece of technology to learn new information or skills about a technology or medium, e.g. uses an automatic teller machine by following instructions given graphically on the screen. Types own name or single words into a computer-assisted learning program.

Note: IoC* - Indicators of Competency sub-level

Writing

Scale	IoC*	**Indicators of Competence**	**Technical Communication**

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Scale	IoC*	**Indicators of Competence**	**Technical Communication**
5	5.4 5.5	Demonstrates well-developed writing skills by selecting stylistic devices to express complex relationships between ideas and purposes. Generates complex written texts with control over generic structure.	Defines the purpose and objectives for the use of a particular technology, e.g. writes a report, which includes a detailed analysis of technology as, applied in a particular workplace or environment. Draws on prior knowledge of the application of technology in researching the capacity of a new system, e.g. writes a briefing and recommends purchase or use of a particular system. Uses technological principles to reduce constraints presented by environmental or physical capacity, e.g. writes a report, which compares the effectiveness and efficiency of manual and computerised record management systems. Prepares a written or oral report, which critically evaluates the content, structure, and purpose of technical texts including graphic, diagrammatic or numerical information. Adapts task instructions to suit changes in technology, e.g. writes plain English instructions for the operation of a new machine based on the manufacturer's instructions. Draws from a number of sources and uses computer skills to prepare a report, e.g. CV and job application letter.
4	4.4 4.5	Communicates complex relationships between ideas by matching style of writing to purpose and audience. Generates written texts reflecting a range of genres and using appropriate structure and layout.	Compares and contrasts views on technology in newspaper articles. Interprets the purposes and objectives for the use of technology after the reading a brochure or manual. Selects technological practices to conform to the guidelines for health and safety, environmental impact and ethical practice, and uses them within those guidelines. Uses guidelines to ensure technological equipment is used to its full capacity. Uses a computer to prepare a typed report from a hand-drafted report. Compares and contrasts different technologies

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Scale	IoC*	**Indicators of Competence**	**Technical Communication**
			and their impact, e.g. argues the case for new practices when using new technologies, reports on the effects of installation of new machinery. Writes a report on the impact of a particular technology for a specific audience, e.g. management committees, tri-partite committees. Reads a complex diagram to identify components and procedures for dealing with a technical fault or breakdown.

Note: IoC* - Indicators of Competency sub-level

Writing – continued

Scale	**IoC***	**Indicators of Competence**	**Technical Communication**
3	3.4 3.5	Communicates relationships between ideas through selecting and using grammatical structures and notations, which are appropriate to the purpose. Produces and sequences paragraphs according to purpose of text.	Reads a technical manual where the information is supported by diagrams, sufficiently well to be able to locate and comprehend particular information required, e.g. programs a VCR to record two programs in advance. Uses the author, title, key-word and other search indexes of a library computer. Comprehends short summary information on computer-managed learning packages to choose a relevant package to suit own needs. Uses the word processing program on a computer to produce texts. Writes simple instructions for using familiar technology, e.g. how to use an automatic teller machine. Completes a formatted workplace test, e.g. damage or breakdown report. Writes a brief report on uses of technology, e.g. for classroom, workplace, domestic or community purposes.
2	2.3	Writes about a familiar topic using simple sentence structure and joining ideas through	Reads short, relevant, explicit, clearly formatted texts related to technology, e.g. the

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Scale	IoC*	Indicators of Competence	Technical Communication
	2.4	conjunctive links where appropriate. Completes forms or writes notes using factual or personal information relating to familiar contexts.	author and title index of a library computer. Chooses a computer assisted learning package, having read short descriptions of one or two programs, to acquire a defined skill or area of knowledge. Writes a short description, e.g. describes a damaged part of a machine to facilitate repair. Extracts information from a list with language and numeracy components, e.g. price lists of components for computer systems. Records simple and routine information using the telephone, e.g. takes a phone message, on a form designed for this purpose. Interprets instructions, which combine pictorial and written information, e.g. directions on how to operate a piece of machinery safely.
1	1.3 1.4 1.5	Copies letters of the alphabet, numbers, and dates in order to convey personal details such as name, address, telephone number. Writes basic personal details about self or others such as name, address, and signature. Writes one or two phrases/simple sentences conveying an idea, message or opinion drawing from a modelled text.	Recognises very short, explicit, pictorial texts, e.g. understands logos related to worker safety before using a piece of machinery, reads letters on a keyboard. Reads graphic instructions accompanying a new piece of technology to learn new information or skills about a technology or medium, e.g. uses an automatic teller machine by following instructions given graphically on the screen. Types own name or single words into a computer-assisted learning program.

Note: IoC* - Indicators of Competency sub-level

Numeracy

Scale	IoC*	Indicators of Competence	Technical Communication
5	5.10	Interprets, selects and investigates appropriate mathematical information and	Calculates distance, length and location using the trigonometry and geometry of triangles in relevant situations, e.g. locates grid reference on

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Scale	IoC*	Indicators of Competence	Technical Communication
	5.11 5.12	relationships highly embedded in an activity, item or text. Selects and applies a wide range of mathematical strategies flexibly to generate solutions to problems across a broad range of contexts. Uses a wide range of oral and written informal and formal language and representation including symbols, diagrams and charts to communicate mathematically.	a map for a boat travelling on an given bearing with time and speed specified; uses dimensions provided on a scaled plan of a roof to find the pitch or slope of the roof. Calculates quantities of materials to title the roof applying a 4% allowance for wastage. Plans and gathers information on a negotiated topic form a variety of sources including government, industry and media about relevant community or workplace issues. Organises information by grouping. Graphically represents and analyses information for a particular purpose. Presents, individually or in a team, a report expressing a viewpoint, which is substantiated by discussion of supporting statistical evidence. Interprets and applies metric quantities and numbers in scientific notation, e.g. calculates the amount of oil in litres spilled from a tanker if it covers a surface area of water of approximately 1200 hectares (1.2 x 107m2) to a thickness of 6 x 103mm. Uses financial formulae, e.g. simple and compound interest to calculate and contrast the interest incurred in borrowing money from financial institutions.
4	4.10 4.11 4.12 4.13	Selects and investigates appropriate mathematical information and relationships embedded in an activity, item or text. Selects and applies an expanding range of mathematical strategies flexibly to solve problems in a variety of contexts. Examines and questions the appropriateness, possible interpretations and implications of aspects of a mathematical activity. Uses a range of oral and written informal and formal	Uses ratio and scale to interpret dimensions on a basic plan. Applies similarity and ratio to estimate and calculate lengths, e.g. finds height of a building, a tree. Compares quality and costs of using imported vs. Australian tiles, discount vs. brand name paints. Presents information in appropriate graphical format to show different interpretations and influences, e.g. analysis of government spending on education. Applies formulae and interprets results relevant to a familiar practical situation, measuring the dimensions needed and substituting them into the formula, adjusting units where necessary,

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Scale	IoC*	Indicators of Competence	Technical Communication
		language and representation including symbols, diagrams and charts to communicate mathematically.	e.g. length of edging for circular garden or pond, capacity of a water tank or bath. Uses area and perimeter to calculate a range of options, e.g. given a certain length of fencing, plan a range of options for paddock dimensions, which meet specific area requirements. Calculates and contrasts monthly income from average sales, given a variety of salary options involving retainers and commission rates.

Note: IoC* - Indicators of Competency sub-level

Numeracy – continued

Scale	IoC*	Indicators of Competence	Technical Communication
3	3.10 3.11 3.12 3.13	Selects appropriate mathematical information embedded in a real life activity, item or text. Selects and applies a range of mathematical strategies to solve problems in a number of contexts which are familiar and may be interrelated. Reflects on and questions reasonableness and appropriateness of the purpose, process and outcomes of a mathematical activity. Uses oral and written informal and formal language and representation including symbols and diagrams to communicate mathematically.	Uses a distance scale to find the shortest route between two locations on a map and considers road terrain conditions in deciding preferred route. Expresses and calculates with metric quantities, eg interprets and costs quantities of cheese given different forms such as 350g, 0.35kg. Measures common three-dimensional shapes, eg room, and represents the information on an appropriate diagram drawn to scale. Calculates with common, fractions and metric measurements, eg adjusts the quantities in a recipe by halving or doubling to obtain the required amount. Uses a variety of methods to analyse advertising by comparing savings on a number of different items, eg at 12% off, 15% off, 1/3 off, price reduced by $10. Compares casual and permanent rates of pay over a given time span for work of the same nature.
2	2.9	Locates relevant mathematical information in a familiar real life	Compares measurements taken with estimated lengths of familiar objects, eg

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Scale	IoC*	Indicators of Competence	Technical Communication
	2.10 2.11 2.12	activity text. Selects and uses straightforward mathematical actions in familiar and predictable contexts. Uses estimation and prior experience to examine purpose and check reasonableness of the process and outcomes of a mathematical activity. Uses oral and written informal and formal language and representation some symbols and diagrams to communicate mathematically.	estimates and measures storeroom dimensions.
1	1.10 1.11 1.12 1.13	Locates simple key mathematical information in a familiar real life activity text. Recognises and uses straightforward mathematical actions which relate to immediate contexts. Uses rough estimation and prior experience to identify purpose and check reasonableness of the process and outcomes of a mathematical activity. Uses everyday informal oral language and representation including familiar symbols and diagrams to communicate mathematically.	Estimates lengths of familiar objects using metric units, eg a person's height, height of doorway.

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UEE10111 Certificate I in ElectroComms Skills

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
2	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20

Description

Scope
This qualification provides competencies to perform basic work activities, including identifying and using a range of components, accessories, materials, tools, equipment, technologies, and customs for carrying out work in the Electrotechnology –Communications Industry. Sectors in the industry are electronics, electrical, communications, including telecommunications – voice, data, video and information technology, computer systems, instrumentation, lifts, refrigeration and air conditioning, and renewable/sustainable energy.
Note: Sectors in the industry are electronics, electrical, communications including telecommunications – voice, data, video and information technology, computer systems, instrumentation, lifts, refrigeration and air conditioning, and renewable/sustainable energy.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 60 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEE148A	Carry out routine work activities in an energy sector environment	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**120**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 60 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Competency Standard Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 1. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	30

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B	**Qualification Elective Units** You may select all your elective units from this Group	30	60

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 30		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 1. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 30 Points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 30 You may select all your elective units from this Group		**Weighting Points**
UEENEEB101A	Operate and maintain amateur radio communication stations	40
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20

Note:
1. In selecting elective unit's considerations to career planning advice should be given to units that form part a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE20111 Certificate II in Split Air-conditioning and Heat Pump Systems

Modification History

Release	Action	Core/Elective	Details	Points
3	Update	Group A	HLTCPR211A Perform CPR	10
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20

Description

Scope
The installation, commissioning and de-commissioning of single head, split air conditioning and heat pumps systems to a prescribed routine where the maximum plant capacity for each system does not exceed 18 kWr.

This includes wall hung, floor and ceiling suspended, cassette and ducted fan coil split systems and water heating heat pump systems. This qualification excludes competencies required for service, repair, maintenance, diagnostic/fault finding and electrical work or the safe and proper installation of commercial refrigeration, air conditioning and heat pump plant and equipment.

Note: 1. The letter “r” denotes “refrigeration” or cooling capacity, not electrical input power.
2. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 and the Ozone Protection and Synthetic Gas Management Regulations apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Pathways Information

Not Applicable

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Licensing/Regulatory Information

Not Applicable

Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 20 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ105A	Position, assemble and start up single head split air conditioning and water heating heat pump systems	70
UEENEEJ172A	Recover, pressure test, evacuate, charge and leak test refrigerants - split systems	60
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**340**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 20 points from the following

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groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	20
B	**Qualification Elective Units** You may select all your elective units from this Group	0	20

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	Up to 20 points

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	Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

Group B – Qualification Elective Units You may complete units to a maximum weighting of 20 You may select all your elective units from this Group		**Weighting Points**
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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UEE20411 Certificate II in Winding and Assembly

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
3	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
3	Edit	Elective	Correct title of UEENEEC002B - Source and purchase material/parts for installation or service jobs	20
3	Edit	Elective	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40

Description

Scope
This qualification provides competencies to wind, place and connect coils for small armatures, transformers and solenoids following prescribed routines.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG150A	Wind electrical coils	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**200**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units**	100	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units You may select all your elective units from this Group		**Weighting Points**
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG151A	Place and connect electrical coils	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE20511 Certificate II in Computer Assembly and Repair

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	Elective	Correct weighting points of UEENEED146A - Set up and configure basic local area network (LAN)	40

Release	Action	Core/Elective	Details	Points
3	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
3	Edit	Elective	Correct title of UEENEEC002B - Source and purchase material/parts for installation or service jobs	20

Description

Scope
This qualification provides competencies to select components and assemble computer to customer specifications and carry out routine hardware repairs (generally by replacement) of known faulty components following prescribed routines.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**200**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not been assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	100	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001 B	Maintain documentation	20
UEENEEC002 B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008 B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010 B	Deliver a service to customers	20
UEENEEE020 B	Provide basic instruction in the use of electrotechnology apparatus	20
ICTTEN2207A	Install and configure a home or small office network	60
ICTTEN2208A	Install and configure a small to medium business network	60
ICTTEN2209A	Build and maintain a secure network	80
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	Up to 60 Points

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	Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

Group B – Qualification Elective Units Complete units to a minimum weighting of 100 You may select all your elective units from this Group		**Weighting Points**
UEENEED101 A	Use computer applications relevant to a workplace	20
UEENEED143 A	Install and configure a client computer operating system and software	40
UEENEED146 A	Set up and configure basic local area network (LAN)	40
UEENEEE104 A	Solve problems in d.c. circuits	80
UEENEEE105 A	Fix and secure electrotechnology equipment	20
UEENEEE107 A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108 A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE179 A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEH101 A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH102 A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Note:
1. In selecting elective unit's considerations to career planning advice should be given to units that form part a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

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END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE20711 Certificate II in Data and Voice Communications

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
3	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
3	Edit	Core	Correct title of UEENEEF102A - Install and maintain cabling for multiple access to telecommunication services	120
3	Edit	Elective	Correct title of UEENEEC002B - Source and purchase material/parts for installation or service jobs	20

Description

Scope

This qualification provides competencies to select, assemble, set up and maintain simple equipment and systems to a prescribed routine Certification of telecommunication cabling in buildings and premises. It includes ACMA requirements for Open Cabler registration.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

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Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 40 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**380**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 40 points from the following groups:

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Group		Minimum points	Maximum points
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	20
B	**Qualification Elective Units** You may select all your elective units from this Group	20	40

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitstion	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11	Up to 20 points

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	Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

Group B – Qualification Electives You may select all your elective units from this Group		**Weighting Points**
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE20811 Certificate II in Electrical Wholesaling

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
3	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
3	Edit	Elective	Correct title of UEENEEC002B - Source and purchase material/parts for installation or service jobs	20

Description

Scope
This qualification provides competencies for people engaged in electrical wholesaling counter sales and dispatching.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 200 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEE147A	Identify building techniques, methods and materials used in energy sector work activities	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**160**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 200 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	140	200

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 140 You may select all your elective units from this Group		**Weighting Points**
UEENEEC012B	Direct technical and non-technical enquiries to appropriate personnel	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE144A	Apply technologies and concepts to energy sector work activities	40
UEENEEE148A	Carry out routine work activities in an energy sector environment	40
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEK114A	Promote sustainable energy practices in the community	40
UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE20911 Certificate II in Electronic Assembly

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
3	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
3	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
3	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20

Description

Scope
This qualification provides competencies to select components, set up and operate component placement machines and carry out rework to a prescribed routine. It includes selecting components, assembling electronic subsystems and carrying out reworks to a prescribed routine.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

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Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 140 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**220**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 140 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	80	140

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 80 You may select all your elective units from this Group		**Weighting Points**
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	20
UEENEEA106A	Use lead-free soldering techniques	40
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE21011 Certificate II in Fire Alarms Servicing

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
3	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20

Description

Scope
This qualification provides competencies to select, assemble, set up and test base level fire protection systems in domestic and commercial premises.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 140 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH161A	Install fire detection and warning system apparatus	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**220**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 140 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	80	140

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 80 You may select all your elective units from this Group		**Weighting Points**
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEF101A	Install and connect cabling for direct access to telecommunications service	20
UEENEEH162A	Verify compliance and functionality of fire protection system installations	60
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE21211 Certificate II in Antennae Equipment

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Elective	Correct weighting points of UEENEED146A - Set up and configure basic local area network (LAN)	40
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	RIIWHS202D - Enter and work in confined spaces	30
4	Update	Elective	RIIWHS204D - Work safely at heights	20
4	Update	Elective	RIIWHS205D - Control traffic with stop-slow bat	10
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Elective	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80
4	Edit	Elective	Correct title of UEENEEE123A - Solve basic problems electronic and digital equipment and circuits	80

Description

Scope
This qualification provides competencies to select, assemble, connect and set up TV and radio reception antennae and multiple antenna outlets in buildings and premises.

Pathways Information

Not applicable.

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Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 120 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	60
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**240**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 120 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	60	120

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
RIIWHS202D	Enter and work in confined spaces	30
RIIWHS204D	Work safely at heights	20
RIIWHS205D	Control traffic with stop-slow bat	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	Up to 60 points

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	Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

Group B – Qualification Elective Units Complete units to a minimum weighting of 60 You may select all your elective units from this Group		**Weighting Points**
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED146A	Set up and configure basic local area network (LAN)	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH104A	Set up and test residential video/audio equipment	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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Custom Content Section

Not applicable.

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UEE21311 Certificate II in Remote Area Essential Service

Modification History

Release	Action	Core/Elective	Details	Points
2	Update to Release 2	Group A	NWP209B Use maps, plans, drawings and specifications	10
2	Update	Group A	NWP210B Perform basic water quality tests	10
2	Update	Group A	NWP218B Perform and record sampling	10
2	Update	Group A	NWP226B Prepare and restore work site	10
2	Update	Group A	NWP227B Control vegetation on a site	10
2	Update	Group A	NWP229B Repair minor structures	10
2	Update	Group A	NWP243B Operate bore fields and groundwater source systems	10
2	Update	Group A	NWP245B Maintain tanks and water storage assets	10
2	Update	Group A	NWP247A Maintain catchment and surrounding areas	10
2	Update	Group A	NWP253B Install and repair water services	10
2	Update	Group A	NWP255B Maintain and repair wastewater collection assets	10
2	Update	Group A	NWP256B Monitor and report water distribution systems	10
2	Update	Group A	NWP257B Maintain and repair wastewater collection systems	10
2	Update	Group A	NWP259B Operate, monitor and maintain pump stations	10
2	Update	Group A	NWP260A Monitor and report water treatment processes	10
2	Update	Group A	NWP261A Operate and maintain water treatment plant and equipment	10

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2	Update	Group A	NWP262A Monitor and report wastewater treatment processes	10
2	Update	Group A	NWP263A Operate and maintain wastewater treatment plant and equipment	10
2	Update	Group A	NWP268B Monitor, operate and report chlorine disinfection systems	10
2	Update	Group A	NWP276A Monitor, operate and report fluoridation processes	10

3	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
3	Edit	Elective	Correct title of UEENEEK117A - Maintain and repair facilities associated with remote area essential service operations	120
3	Edit	Elective	Correct title of UEENEEK118A - Maintain and monitor remote area essential service (RAPS) operations	120

Description

Scope
This qualification provides competencies to select, assemble, set up and maintain simple equipment and systems following prescribed routines.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 200 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems	20
UEENEEK102A	Work safely with remote area power supply systems	20
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**160**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 200 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units**	0	160

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	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.		
B	**Qualification Elective Units** You may select all your elective units from this Group	40	200

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 160		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
MEM05012C	Perform routine manual metal arc welding	20
MEM05007C	Perform manual heating and thermal cutting	20
NWP209B	Use maps, plans, drawings and specifications	30
NWP210B	Perform basic water quality tests	20
NWP218B	Perform and record sampling	20
NWP226B	Prepare and restore work site	30
NWP227B	Control vegetation on a site	20
NWP229B	Repair minor structures	20
NWP243B	Operate bore fields and groundwater source systems	20
NWP245B	Maintain tanks and water storage assets	30
NWP247A	Maintain catchment and surrounding areas	40
NWP253B	Install and repair water services	40

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NWP255B	Maintain and repair wastewater collection assets	20
NWP256B	Monitor and report water distribution systems	30
NWP257B	Maintain and repair wastewater collection systems	30
NWP259B	Operate, monitor and maintain pump stations	30
NWP260A	Monitor and report water treatment processes	30
NWP261A	Operate and maintain water treatment plant and equipment	30
NWP262A	Monitor and report wastewater treatment processes	30
NWP263A	Operate and maintain wastewater treatment plant and equipment	30
NWP268B	Monitor, operate and report chlorine disinfection systems	30
NWP276A	Monitor, operate and report fluoridation processes	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 160 Points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 40 You may select all your elective units from this Group		**Weighting Points**
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE131A	Solve problems in ELV circuits for non electrical workers	40
UEENEEE151A	Transport apparatus, equipment and materials	60
UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks	40
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets	40
UEENEEK105A	Conduct periodic maintenance of remote area power supply photo voltaic arrays	40
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators	40
UEENEEK111A	Assemble and connect remote area power supplies	60
UEENEEK112A	Provide basic sustainable energy solutions for energy reduction in residential premises	40
UEENEEK114A	Promote sustainable energy practices in the community	40
UEENEEK116A	Maintain and repair remote area power generation facilities	120

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UEENEEK117A	Maintain and repair facilities associated with remote area essential service operations	120
UEENEEK118A	Maintain and monitor remote area essential service (RAPS) operations	120
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	80
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE21411 Certificate II in Remote Area Power Supply Maintenance

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
3	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
3	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
3	Edit	Elective	Correct title of UEENEEK117A - Maintain and repair facilities associated with remote area essential service operations	120

Description

Scope
This qualification provides competencies in routine maintenance of remote area power supplies consisting of battery banks, generator sets, photovoltaic arrays and wind generators. Primarily for use by, but not exclusive to, indigenous communities.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

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Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems	20
UEENEEK102A	Work safely with remote area power supply systems	20
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**200**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	100	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 100 You may select all your elective units from this Group		**Weighting Points**
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks	40
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets	40
UEENEEK105A	Conduct periodic maintenance of remote area power supply photo voltaic arrays	40
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators	40
UEENEEK111A	Assemble and connect remote area power supplies	60
UEENEEK112A	Provide basic sustainable energy solutions for energy reduction in residential premises	40
UEENEEK114A	Promote sustainable energy practices in the community	40
UEENEEK116A	Maintain and repair remote area power generation facilities	120
UEENEEK117A	Maintain and repair facilities associated with remote area essential service operations	120

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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Custom Content Section

Not applicable.

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UEE21611 Certificate II in Security Assembly and Set-up

Modification History

Not applicable.

Description

Scope
This qualification provides competencies to select, assemble and set-up of wired and wireless base level security systems following prescribe routines.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 120 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**240**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 120 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state	0	60

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	accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.		
B	**Qualification Elective Units** You may select all your elective units from this Group	60	120

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 Points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 60 You may select all your elective units from this Group		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEF101A	Install and connect cabling for direct access to telecommunications service	20
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE21711 Certificate II in Technical Support

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Add	Group B	UEENEEA107A - Make up wiring looms for internal wiring of appliances and machinery	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10

Description

Scope
This qualification provides competencies to collect/receive and store stock at work sites, set up and store equipment and tools, assist in installation, fault finding, and maintenance and repair activities.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**200**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:			
Group		Minimum points	Maximum points
	Imported and Common Elective Units	0	60

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A	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.		
B	**Qualification Elective Units** You may select all your elective units from this Group	100	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 Points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 100 You may select all your elective units from this Group		**Weighting Points**
UEENEEA107A	Make up wiring looms for internal wiring of appliances and machinery	40
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE21911 Certificate II in Electronics

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	Elective	Correct weighting points of UEENEED146A - Set up and configure basic local area network (LAN)	40
3	Edit	Core	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	20
3	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	40
3	Edit	Elective	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80
3	Edit	Elective	Correct title of UEENEED143A - Install and configure a client computer operating system and software	40
3	Edit	Elective	Correct title of UEENEEE123A - Solve basic problems electronic and digital equipment and circuits	80
3	Edit	Elective	Correct title of UEENEEF107A - Set up and configure the wireless capabilities of communications and data storage devices	40

Description

Scope
This qualification provides competencies to select, assemble, set up and maintain electronic devices following prescribed routines.

Pathways Information

Not applicable.

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Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 120 points in accordance with the Elective Competency Standard Units table below.

. **Core Competency Standard Units** All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**240**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 120 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported or Non-Technical Competency Standard Units**	0	60

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	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.		
B	**Qualification Elective Units** You may select all your elective units from this Group	60	120

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC008B	Receive and store materials and equipment for electrotechnology work	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 Points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 60 You may select all your elective units from this Group		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA103A	Set up and check electronic component assembly machines	40
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	20
UEENEEA106A	Use lead-free soldering techniques	40
UEENEEB101A	Operate and maintain amateur radio communication stations	40
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE141A	Use of routine equipment/plant/technologies in an energy sector environment	40

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UEENEEE146A	Identify effects of energy on machinery and materials in an energy sector environment	120
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF106A	Solve problems in voice and data communications circuits	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH104A	Set up and test residential video/audio equipment	40
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	60
UEENEEH128A	Install and test microwave antennae and waveguides	60
UEENEEH161A	Install fire detection and warning system apparatus	40
UEENEEH169A	Solve problems in basic electronic circuits	100
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE22011 Certificate II in Electrotechnology (Career Start)

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Elective	Correct title of UEENEEH101A - Repair basic computer equipment faults by replacement of modules/sub-assemblies	40

Description

Scope
This qualification covers competencies for work entry program providing grounding in safety and basic skills and knowledge for work in any electrotechnology discipline.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 140 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE141A	Use of routine equipment/plant/technologies in an energy sector environment	40
UEENEEE148A	Carry out routine work activities in an energy sector environment	40
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**220**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 140 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry	0	60

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	Technical Advisory Committee, their weighting will be 10 points.		
B	**Group B – Qualification Elective Units** You may select all your elective units from this Group	80	140

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 Points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 80 You may select all your elective units from this Group		Weighting Points
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE130A	Provide solutions and report on routine electrotechnology problems	60
UEENEEE142A	Produce products for carrying out energy sector work activities	40
UEENEEE143A	Produce routine tools/devices for carrying out energy sector work activities	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level

END OF QUALIFICATION

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Custom Content Section

Not applicable.

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UEE22111 Certificate II in Sustainable Energy (Career Start)

Modification History

Release	Action	Core/Elective	Details	Points
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Elective	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEP024A - Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20

Description

Scope
This qualification covers competencies for work entry program providing grounding in safety and basic skills and knowledge for work in any electrotechnology discipline.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEK112A	Provide basic sustainable energy solutions for energy reduction in residential premises	40
UEENEEK114A	Promote sustainable energy practices in the community	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**200**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	100	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC010B	Deliver a service to customers	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 2. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1,	Up to 60 points

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	Volume 1 Qualification Framework	

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Group B – Qualification Elective Units Complete units to a minimum weighting of 100 You may select all your elective units from this Group		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE130A	Provide solutions and report on routine electrotechnology problems	60
UEENEEE141A	Use of routine equipment/plant/technologies in an energy sector environment	40
UEENEEE142A	Produce products for carrying out energy sector work activities	40
UEENEEE143A	Produce routine tools/devices for carrying out energy sector work activities	40
UEENEEE148A	Carry out routine work activities in an energy sector environment	40
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60

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UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE30111 Certificate III in Business Equipment

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
4	Edit	Elective	Correct weighting points of UEENEED146A - Set up and configure basic local area network (LAN)	40
5	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
5	Update	Elective	HLTAID003 - Provide first aid	10
5	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
5	Edit	Elective	Correct title of UEENEEE108A - Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40

Description

Scope
This qualification provides competencies to install, set up, test, fault find, repair and maintain photocopiers, fax machines etc.

Pathways Information

Not applicable.

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Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 360 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC013B	Participate in business equipment work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH121A	Fault find and repair high volume office equipment	120
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20

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Core Competency Standard Units All Core competency standard units to be achieved	**Weighting Points**
Total points in core	**700**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 360 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	180
B	**Qualification Elective Units** You may select all your elective units from this Group	180	360

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 180		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of	20

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	electrotechnology apparatus	
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 180 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 180 You may select all your elective units from this Group		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA103A	Set up and check electronic component assembly machines	40
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	20
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEH107A	Repair predictable faults in general electronic apparatus	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH138A	Fault find and repair complex power supplies	40
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

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Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE30211 Certificate III in Computer Systems Equipment

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTFA311A Apply first aid	10
2	Add		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20

Description

Scope
This qualification provides competencies to select, install, set up, test, fault find, repair and maintain computer equipment for data storage, personal computer and networks, measurement/analysis and control.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 500 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC014B	Participate in computer equipment work and competency development activities	60
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**560**

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 500 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	150
B	**Qualification Elective Units** You may select all your elective units from this Group	350	500

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 180		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant	Up to 150 points

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	EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units Complete units to a minimum weighting of 350 You may select all your elective units from this Group		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA106A	Use lead-free soldering techniques	40
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40

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UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.

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2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE30311 Certificate III in Custom Electronics Installations

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTFA311A Apply first aid	10
4	Edit	Elective	Correct weighting points of UEENEED146A - Set up and configure basic local area network (LAN)	40
5	Update	Elective	HLTAID003 - Provide first aid	10
5	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
5	Edit	Elective	Correct title of UEENEEH117A - Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
5	Edit	Elective	Correct title of UEENEEH174A - Troubleshoot audio - video recording equipment	120

Description

Scope
This qualification provides competencies to select, install, set up and test surround sound, home theatre and integration aspects for ‘intelligent houses’. It covers the scope of CEDIA certification level 2

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

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Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 460 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH104A	Set up and test residential video/audio equipment	40
UEENEEH105A	Verify functionality and compliance of custom electronic installations	40
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises	120
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20

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Core Competency Standard Units All Core competency standard units to be achieved	**Weighting Points**
Total points in core	**600**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 460 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	150
B	**Qualification Elective Units You may select all your elective units from this Group**	310	460

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 180		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20

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HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 150 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 310 You may select all your elective units from this Group		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA106A	Use lead-free soldering techniques	40
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH107A	Repair predictable faults in general electronic apparatus	40
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	60
UEENEEH109A	Set up and test gaming and game equipment	60
UEENEEH110A	Install commercial video/audio system components	120

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UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
UEENEEH118A	Fault find and repair electronic apparatus	40
UEENEEH119A	Repair predictable faults in television receivers	120
UEENEEH120A	Fault find and repair gaming and games equipment	80
UEENEEH124A	Repair predictable faults in audio components	40
UEENEEH127A	Set up and adjust commercial radio frequency (RF) transmission and reception systems	60
UEENEEH128A	Install and test microwave antennae and waveguides	60
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100
UEENEEH171A	Troubleshoot faults in television receivers	120
UEENEEH172A	Troubleshoot communication systems	80
UEENEEH173A	Troubleshoot professional audio reproduction components	120
UEENEEH174A	Troubleshoot audio - video recording equipment	120
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UETTDRIS43A	Perform low voltage field switching operation to a given schedule	80
UETTDRIS44A	Perform HV field switching operation to a given schedule	80
UETTDRIS47A	Sample, test, filter and reinstate insulating oil	40
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40

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UETTDRSB39A	Perform power system substation switching operation to a given schedule	50

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE30411 Certificate III in Data and Voice Communications

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10

4	Edit	Elective	Correct weighting points of UEENEED146A - Set up and configure basic local area network (LAN)	40

5	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
5	Update	Elective	HLTAID003 - Provide first aid	10
5	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
5	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
5	Edit	Core	Correct title of UEENEEE108A - Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
5	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
5	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
5	Edit	Elective	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80

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5	Edit	Elective	Correct title of UEENEEE121A - Plan an integrated cabling installation system	40

Description

Scope
This qualification provides competencies to select, install, set up, test, fault find, repair and maintain telecommunications and high performance data services in buildings and premises. It includes ACMA requirements for Open Cabler Registration.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 320 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC016B	Participate in voice and data communications work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF109A	Install and connect data and voice communication equipment	40

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEF111A	Test, report and rectify faults in data and voice installations	40
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**740**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 320 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	100
B	**Qualification Elective Units** You may select all your elective units from this Group	220	320

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20

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UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 100 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 220 You may select all your elective units from this Group		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED146A	Set up and configure basic local area network (LAN)	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF112A	Install aerial telecommunication cables	40
UEENEEF113A	Install underground communication cables	40
UEENEEF114A	Set up and configure basic data communication systems	40
UEENEEF115A	Assemble and connect telecommunication frames and cabinets	60
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE30611 Certificate III in Electrical Machine Repair

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40
4	Edit	Core	Correct title of UEENEEG153A - Rewind three phase low voltage induction machines	60
4	Edit	Core	Correct title of UEENEEG164A - Repair and maintain mechanical components of electrical machines	40
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Core	Correct title of UEENEEP015A - Disconnect - reconnect motors connected to low voltage installation wiring	60

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4	Edit	Elective	Correct title of UEENEEG129A - Overhaul and repair major switchgear and controlgear	60
4	Edit	Elective	Correct title of UEENEEG159A - Conduct mechanical tests on electrical machines and components	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20

Description

Scope
This qualification provides competencies to overhaul and repair motor, transformer and control gear including rewinding

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 180 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC018B	Participate in electrical machine repair work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG150A	Wind electrical coils	40

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UEENEEG151A	Place and connect electrical coils	40
UEENEEG153A	Rewind three phase low voltage induction machines	60
UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
UEENEEP015A	Disconnect - reconnect motors connected to low voltage installation wiring	60
Total points in core		**880**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 180 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	120	180

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20

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UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 120 You may select all your elective units from this Group		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEG152A	Rewind single phase machines	40
UEENEEG154A	Rewind LV direct current machines	60
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ151A	Service small electrical appliances and power tools	60
UEENEEP020A	Locate and rectify faults in low voltage motors using set procedures	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE30711 Certificate III in Switchgear and Controlgear

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Core	Correct title of UEENEEP013A - Disconnect - reconnect control devices connected to low voltage installation wiring	60
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG164A - Repair and maintain mechanical components of electrical machines	60

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4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEH111A - Troubleshoot single phase input d.c. power supplies	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEG129A - Overhaul and repair major switchgear and controlgear	60

Description

Scope
This qualification provides competencies to construction, assembly and wiring of switchboards and control panels.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40
UEENEEA112A	Fabricate and assemble bus bars	40
UEENEEA113A	Mount and wire control panel equipment	40
UEENEEC019B	Participate in switchgear and controlgear work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40

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UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
UEENEEP013A	Disconnect - reconnect control devices connected to low voltage installation wiring	60
Total points in core		**900**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	100	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20

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UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 100 You may select all your elective units from this Group		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEF115A	Assemble and connect telecommunication frames and cabinets	60
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEP018A	Locate and rectify faults in low voltage control devices using set procedures	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE30811 Certificate III in Electrotechnology Electrician

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Add	Group B	UEENEEJ105A Position, assemble and start up single head split air conditioning and water heating heat pump systems	70
2	Add	Group B	UEENEEJ172A Recover, pressure test, evacuate, charge and leak test refrigerants — split systems	60
2	Add	Group B	UETTDRIS67A Solve problems in energy supply network equipment	80
2	Add	Group B	UETTDRIS68A Solve problems in energy supply network protection equipment and systems	40
2	Add	Group B	UETTDRIS44A Perform HV field switching operation to a given schedule	60

3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title	40

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			UEENEEI105A Solve problems in temperature measurement components and systems	

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEE121A - Plan an integrated cabling installation system	40
4	Edit	Elective	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	60
4	Edit	Elective	Correct title of UEENEEG113A - Install and maintain emergency safety systems	60
4	Edit	Elective	Correct title of UEENEEG116A - Diagnose and rectify faults in traction lift systems	60
4	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG120A - Select and arrange equipment for special LV electrical installations	60
4	Edit	Elective	Correct title of UEENEEG126A - Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40
4	Edit	Elective	Correct title of UEENEEG129A - Overhaul and repair major switchgear and controlgear	60
4	Edit	Elective	Correct title of UEENEEG153A - Rewind three	60

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			phase low voltage induction machines	
4	Edit	Elective	Correct title of UEENEEG159A - Conduct mechanical tests on electrical machines and components	40
4	Edit	Elective	Correct title of UEENEEG164A - Repair and maintain mechanical components of electrical machines	60
4	Edit	Elective	Correct title of UEENEEG165A - Maintain and service traction lifts systems and equipment	40
4	Edit	Elective	Correct title of UEENEEG166A - Install and maintain escalators, moving walks and treadways	40
4	Edit	Elective	Correct title of UEENEEG167A - Align and install traction lift equipment	20
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEH150A - Assemble and set up basic security systems	80
4	Edit	Elective	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEK148A - Install, configure and commission LV grid connected photovoltaic power systems	40
4	Edit	Elective	Correct title of UEENEEN104A - Test copper rail signalling cables	20
4	Edit	Elective	Correct title of UETTDRIS43A - Perform low voltage field switching operation to a given schedule	50

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Description

Scope

This qualification provides competencies to select, install, set up, test, fault find, repair and maintain electrical systems and equipment in building and premises. It includes ERAC requirements for an 'Electrician's licence'.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 140 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC020B	Participate in electrical work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**920**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 140 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	80	140

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Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 80 You may select all your elective units from this Group		**Weighting Points**
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40
UEENEEA112A	Fabricate and assemble bus bars	40
UEENEEA113A	Mount and wire control panel equipment	40
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG113A	Install and maintain emergency safety systems	60
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG120A	Select and arrange equipment for special LV electrical installations	60
UEENEEG126A	Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60

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UEENEEG150A	Wind electrical coils	40
UEENEEG151A	Place and connect electrical coils	40
UEENEEG152A	Rewind single phase machines	40
UEENEEG153A	Rewind three phase low voltage induction machines	60
UEENEEG154A	Rewind LV direct current machines	60
UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEG165A	Maintain and service traction lifts systems and equipment	40
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40
UEENEEG167A	Align and install traction lift equipment	20
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEG189A	Install and maintain emergency lighting systems	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI140A	Plan the electrical installation of integrated	20

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	systems	
UEENEEI141A	Develop electrical integrated systems	20
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ105A	Position, assemble and start up single head split air conditioning and water heating heat pump systems	70
UEENEEJ172A	Recover, pressure test, evacuate, charge and leak test refrigerants — split systems	60
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20

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UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40
UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM076A	Use and maintain the integrity of a portable gas	20

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	detection device	
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
UEENEEN102A	Assemble and wire internal electrical rail signalling equipment	30
UEENEEN103A	Install and maintain rail track circuit leads and bonds	30
UEENEEN104A	Test copper rail signalling cables	20
UEENEEN121A	Repair rail signalling power and control cables	40
UETTDRIS43A	Perform low voltage field switching operation to a given schedule	50
UETTDRIS44A	Perform HV field switching operation to a given schedule	50
UETTDRIS47A	Sample, test, filter and reinstate insulating oil	40
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40
UETTDRSB23A	Install and maintain substation direct current systems	30
UETTDRSB29A	Maintain capacitor bank equipment for voltage regulation	40
UETTDRSB39A	Perform power system substation switching operation to a given schedule	50

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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Custom Content Section

Not applicable.

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UEE30911 Certificate III in Electronics and Communications

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring	60
2	Add	Group B	UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures	20
2	Add	Group B	UEENEEI150A Develop, enter and verify discrete control programs for programmable controllers	60
2	Update	Group A	HLTFA311A Apply first aid	10
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	MSS402001A Apply competitive systems and practices	20
2	Update	Group A	MSS402021A Apply Just in Time procedures	20
2	Update	Group A	MSS402080A Undertake root cause analysis	20
2	Update	Group A	MSS402081A Contribute to the application of a proactive maintenance strategy	20
2	Update	Group A	MSS402040A Apply 5S procedures	20
2	Update	Group A	MSS402020A Apply quick changeover procedures	20

3	Remove	Group B	UEENEEH189A Provide Gate Array solutions for complex electronics systems	60
3	Add	Group B	UEENEEP010A Disconnect / reconnect appliances connected to low voltage installation wiring.	60

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4	Edit	Elective	Correct weighting points of UEENEED146A - Set up and configure basic local area network (LAN)	40

5	Update	Elective	HLTAID003 - Provide first aid	10
5	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
5	Edit	Elective	Correct title of UEENEEH117A - Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
5	Edit	Elective	Correct title of UEENEEH174A - Troubleshoot audio - video recording equipment	120
5	Edit	Elective	Correct title of UEENEEP010A - Disconnect - reconnect appliances connected to low voltage installation wiring	60
5	Edit	Elective	Correct title of UEENEEP025A - Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

Description

Scope

This qualification provides competencies to select, install, set up, test, fault find, repair and maintain electronic equipment and devices at component/sub-assembly level with options in communications, audio, video and TV, personal computer and networks, security and custom installations

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

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Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 380 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC021B	Participate in electronics and communications work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH138A	Fault find and repair complex power supplies	40
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH146A	Solve fundamental electronic communications system problems	40
UEENEEK142A	Apply environmentally and sustainable procedures in	20

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
	the energy sector	
Total points in core		**680**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 380 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	180
B	**Qualification Elective Units** You may select all your elective units from this Group	200	380

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 180		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of	20

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	electrotechnology apparatus	
HLTAID003	Provide first aid	10
ICTTEN3056A	Install telecommunications network equipment	40
MSS402001A	Apply competitive systems and practices	20
MSS402020A	Apply quick changeover procedures	20
MSS402021A	Apply Just in Time procedures	20
MSS402040A	Apply 5S procedures	20
MSS402080A	Undertake root cause analysis	20
MSS402081A	Contribute to the application of a proactive maintenance strategy	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 180 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 200 You may select all your elective units from this Group		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA103A	Set up and check electronic component assembly machines	40
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	20
UEENEEA106A	Use lead-free soldering techniques	40
UEENEEB101A	Operate and maintain amateur radio communication stations	40
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	40
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40

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UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF106A	Solve problems in voice and data communications circuits	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEF111A	Test, report and rectify faults in data and voice installations	40
UEENEEF114A	Set up and configure basic data communication systems	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH103A	Repair routine business equipment faults	120

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UEENEEH104A	Set up and test residential video/audio equipment	40
UEENEEH105A	Verify functionality and compliance of custom electronic installations	40
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises	120
UEENEEH107A	Repair predictable faults in general electronic apparatus	40
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	60
UEENEEH109A	Set up and test gaming and game equipment	60
UEENEEH110A	Install commercial video/audio system components	120
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus	40
UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
UEENEEH118A	Fault find and repair electronic apparatus	40
UEENEEH119A	Repair predictable faults in television receivers	120
UEENEEH120A	Fault find and repair gaming and games equipment	80
UEENEEH121A	Fault find and repair high volume office equipment	120
UEENEEH122A	Fault find and repair remote control apparatus	60
UEENEEH123A	Fault find and repair microwave heating apparatus	40
UEENEEH124A	Repair predictable faults in audio components	40
UEENEEH127A	Set up and adjust commercial radio frequency (RF) transmission and reception systems	60

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UEENEEH128A	Install and test microwave antennae and waveguides	60
UEENEEH142A	Solve oscillator problems	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH154A	Program and commission commercial security systems	60
UEENEEH155A	Program and commission commercial access control security systems	60
UEENEEH156A	Program and commission commercial security closed circuit television systems	60
UEENEEH161A	Install fire detection and warning system apparatus	40
UEENEEH162A	Verify compliance and functionality of fire protection system installations	60
UEENEEH163A	Enter and verify programs for fire protection systems	40
UEENEEH164A	Commission large fire protection systems	40
UEENEEH165A	Troubleshoot fire protection systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100
UEENEEH171A	Troubleshoot faults in television receivers	120
UEENEEH172A	Troubleshoot communication systems	80
UEENEEH173A	Troubleshoot professional audio reproduction components	120
UEENEEH174A	Troubleshoot audio - video recording equipment	120
UEENEEH187A	Solve problems in electronic musical equipment	40

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	circuits	
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI117A	Calibrate, adjust and test measuring instruments	40
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEP010A	Disconnect - reconnect appliances connected to low voltage installation wiring	60
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	60
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE31011 Certificate III in Fire Protection Control

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Core	CPPFES2043A Prevent ozone depleting substance and synthetic greenhouse gas emissions	10
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE108A - Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
4	Edit	Core	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Core	Correct title of UEENEEH161A - Install fire detection and warning system apparatus	40
4	Edit	Core	Correct title of UEENEEH162A - Verify compliance and functionality of fire protection system installations	60

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4	Edit	Core	Correct title of UEENEEH163A - Enter and verify programs for fire protection systems	40
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEH164A - Commission large fire protection systems	40
4	Edit	Elective	Correct title of UEENEEH165A - Troubleshoot fire protection systems	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEP013A - Disconnect - reconnect control devices connected to low voltage installation wiring	60

Description

Scope
This qualification provides competencies to select, install, set up, test, fault find, repair and maintain fire protection systems in multiple, commercial and industrial premises.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 370 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC022B	Participate in fire protection control work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH161A	Install fire detection and warning system apparatus	40
UEENEEH162A	Verify compliance and functionality of fire	60

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
	protection system installations	
UEENEEH163A	Enter and verify programs for fire protection systems	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
CPPFES2043A	Prevent ozone depleting substance and synthetic greenhouse gas emissions	10
Total points in core		**690**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 370 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
B	**Qualification Elective Units** You may select all your elective units from this Group	200	370

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 170		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20

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UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 170 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 200 You may select all your elective units from this Group		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH164A	Commission large fire protection systems	40
UEENEEH165A	Troubleshoot fire protection systems	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEM024A	Install explosion-protected equipment and wiring systems - gas atmospheres	60
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
UEENEEP013A	Disconnect - reconnect control devices connected to low voltage installation wiring	60
UEENEEP018A	Locate and rectify faults in low voltage control devices using set procedures	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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Custom Content Section

Not applicable.

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UEE31111 Certificate III in Gaming Electronics

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80
4	Edit	Elective	Correct title of UEENEEE123A - Solve basic problems electronic and digital equipment and circuits	80

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4	Edit	Elective	Correct title of UEENEEE179A - Identify and select components, accessories and materials for energy sector work activities	20

Description

Scope
This qualification provides competencies to select, install, set up, test, fault find, repair and maintain gaming machines used in registered clubs and hotels and dedicated games machines used in electronic game venues.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 360 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC023B	Participate in gaming electronic work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH109A	Set up and test gaming and game equipment	60
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEK142A	Apply environmentally and sustainable procedures in	20

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
	the energy sector	
Total points in core		**700**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 360 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	160
B	**Qualification Elective Units** You may select all your elective units from this Group	200	360

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 160		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20

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UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 160 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 200 You may select all your elective units from this Group		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE108A	Lay wiring/cabling and terminate accessories for ELV circuits	40
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEH107A	Repair predictable faults in general electronic apparatus	40
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH120A	Fault find and repair gaming and games equipment	80
UEENEEH138A	Fault find and repair complex power supplies	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE31211 Certificate III in Instrumentation and Control

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI106A Set up and adjust PID control loops	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI110A Set up and adjust advanced PID process control loops	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI114A Trouble shoot process control systems	60

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4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE119A - Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
4	Edit	Core	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Core	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Core	Correct title of UEENEEI107A - Install instrumentation and control cabling and tubing	20
4	Edit	Core	Correct title of UEENEEI108A - Install instrumentation and control apparatus and associated equipment	20
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Core	Correct title of UEENEEP013A - Disconnect - reconnect control devices connected to low voltage installation wiring	60
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEI115A - Trouble shooting in medical equipment control systems	120
4	Edit	Elective	Correct title of UEENEEI117A - Calibrate, adjust and test measuring instruments	40

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Description

Scope

This qualification provides competencies to select, install, set up, test, fault find, repair and maintain systems and devices for measurement and recording of physical/chemical phenomenon and related process control.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 140 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC024B	Participate in instrumentation and control work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI106A	Set up and adjust PID control loops	40
UEENEEI107A	Install instrumentation and control cabling and tubing	20
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI110A	Set up and adjust advanced PID process control loops	40
UEENEEI111A	Find and rectify faults in process final control elements	40
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations	40
UEENEEI113A	Setup and configure human-machine interface (HMI) and industrial networks	60
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
UEENEEP013A	Disconnect - reconnect control devices connected to low voltage installation wiring	60
Total points in core		**920**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 140 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	80	140

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting	Up to 60 points

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	will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units Complete units to a minimum weighting of 80 You may select all your elective units from this Group		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEI114A	Trouble shoot process control systems	60
UEENEEI115A	Trouble shooting in medical equipment control systems	120
UEENEEI117A	Calibrate, adjust and test measuring instruments	40
UEENEEI118A	Set up weighting measuring and control instruments	20
UEENEEI131A	Set up gas analysis measuring and control instruments	20
UEENEEI132A	Set up water analysis measuring and control instruments	20
UEENEEI133A	Set up scientific analysis measuring and control instruments	20
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60

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UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE31411 Certificate III in Security Equipment

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE108A - Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
4	Edit	Core	Correct title of UEENEEH150A - Assemble and set up basic security systems	40
4	Edit	Core	Correct title of UEENEEH151A - Install large security systems	40
4	Edit	Core	Correct title of UEENEEH152A - Enter instructions and test wired and wireless security systems	40
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40

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4	Edit	Elective	Correct title of UEENEEH153A - Program and test large security systems	120
4	Edit	Elective	Correct title of UEENEEH154A - Program and commission commercial security systems	60
4	Edit	Elective	Correct title of UEENEEH155A - Program and commission commercial access control security systems	60
4	Edit	Elective	Correct title of UEENEEH156A - Program and commission commercial security closed circuit television systems	60

Description

Scope

This qualification provides competencies in installation and pre-commissioning set up of wired and wireless security systems in multiple, commercial industrial premises.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 420 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC026B	Participate in security equipment work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20

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Core Competency Standard Units All Core competency standard units to be achieved	**Weighting Points**
Total points in core	**640**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 420 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
B	**Qualification Elective Units** You may select all your elective units from this Group	250	420

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 170		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20

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UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 170 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 250 You may select all your elective units from this Group		**Weighting Points**
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH104A	Set up and test residential video/audio equipment	40
UEENEEH118A	Fault find and repair electronic apparatus	40
UEENEEH153A	Program and test large security systems	120
UEENEEH154A	Program and commission commercial security systems	60
UEENEEH155A	Program and commission commercial access control security systems	60
UEENEEH156A	Program and commission commercial security closed circuit television systems	60
UEENEEH169A	Solve problems in basic electronic circuits	100

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE31511 Certificate III in Rail - Communications and Networks

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	20
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20

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Description

Scope

This qualification provides competencies to select, install, commission, fault find and maintain radio and dedicated telecommunications networks in rail equipment.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 380 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC027B	Participate in rail communications and networks work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH138A	Fault find and repair complex power supplies	40
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEK142A	Apply environmentally and sustainable procedures in	20

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
	the energy sector	
Total points in core		**680**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 380 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
B	**Qualification Elective Units** You may select all your elective units from this Group	210	380

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 170		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20

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UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 170 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 210 You may select all your elective units from this Group		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	60
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEH115A	Develop software solutions for microcontroller based systems	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE32011 Certificate III in Renewable Energy - ELV

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE108A - Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
4	Edit	Core	Correct title of UEENEEE119A - Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Core	Correct title of UEENEEK128A - Solve problems in stand-alone renewable energy systems	120
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEK117A - Maintain and repair facilities associated with remote area essential service operations	120
4	Edit	Elective	Correct title of UEENEEK130A - Solve problems in wind energy conversion systems rated up to 10 kW	60

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4	Edit	Elective	Correct title of UEENEEK134A - Install ELV stand-alone photovoltaic power systems	60
4	Edit	Elective	Correct title of UEENEEK143A - Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
4	Edit	Elective	Correct title of UEENEEP026A - Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Description

Scope

Select, install, set up, test, fault find, repair and maintain renewable energy equipment and systems. It does not include electrical work covered by licensing requirements declared by the Electrical Regulators Advisory Council (ERAC) for an 'Electrician's licence'.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 360 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC021B	Participate in electronics and communications work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	80
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK127A	Diagnose and rectify faults in renewable energy	60

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	control systems	
UEENEEK128A	Solve problems in stand-alone renewable energy apparatus and systems	60
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
UEENEEK149A	Verify compliance and functionality of a extra low voltage renewable energy installation	40
Total points in core		**700**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 360 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
B	**Qualification Elective Units** You may select all your elective units from this Group	190	360

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 170		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20

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UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 170 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 190 You may select all your elective units from this Group		**Weighting Points**
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems	20
UEENEEK102A	Work safely with remote area power supply systems	20
UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks	40
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets	40
UEENEEK105A	Conduct periodic maintenance of remote area power supply photo voltaic arrays	40
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators	40
UEENEEK107A	Conduct checks in the demand side use of remote area power supplies (RAPS)	40
UEENEEK108A	Plan periodic maintenance schedules of remote area power supplies (RAPS)	40
UEENEEK109A	Attend to breakdowns in remote area power supplies (RAPS)	20
UEENEEK116A	Maintain and repair remote area power generation facilities	120
UEENEEK117A	Maintain and repair facilities associated with remote area essential service operations	120
UEENEEK120A	Maintain operation of remote area power generation plant	120
UEENEEK124A	Solve basic problems in micro hydro systems	20
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW	60
UEENEEK134A	Install ELV stand-alone photovoltaic power systems	60

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UEENEEK137A	Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
UEENEEK143A	Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20
UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE32111 Certificate III in Appliance Service

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEJ153A - Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20

Description

Scope
This qualification provides competencies to set-up, service and repair electrical and refrigerated appliances with electives in gas appliances.
Note: The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

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Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 220 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		
UEENEEC017B	Participate in appliance servicing work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ151A	Service small electrical appliances and power tools	60
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ154A	Find and rectify faults in appliance control systems and devices	60
UEENEEJ155A	Service refrigeration appliances	60
UEENEEJ156A	Service clothes washing machines and dryers	40
UEENEEJ161A	Verify functionality and compliance of appliances	20

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UEENEEJ162A	Recover, pressure test, evacuate, charge and leak test refrigerants - appliances	50
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40
UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances	50
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	60
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20
Total points in core		**840**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 220 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	100
B	**Qualification Elective Units** You may select all your elective units from this Group	120	220

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Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 100 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 120 You may select all your elective units from this Group		**Weighting Points**
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ118A	Resolve problems in post mix refrigeration systems	20
UEENEEJ157A	Service electrical heating appliances	60
UEENEEJ158A	Service dishwasher machines	40
UEENEEJ159A	Service gas heating appliances	40
UEENEEJ171A	Resolve problems in refrigerated beverage vending cabinets	20
UEENEEJ173A	Service and repair microwave ovens	40
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10
UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	20
UEENEEJ184A	Apply safety awareness and legal requirements for carbon dioxide refrigerant	10
UEENEEJ188A	Repair and service self contained carbon dioxide refrigeration and heat pump systems	20
UEENEEJ189A	Service room air conditioners	30

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE32211 Certificate III in Air-conditioning and Refrigeration

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10

5	Update	Group A	CPCPCM2043A – Carry out WHS requirements	40
5	Update	Group A	CPCPMS3035A – Install and test ducting systems	10

6	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
6	Update	Elective	HLTAID003 - Provide first aid	10
6	Edit	Core	Correct title of UEENEEJ153A - Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
6	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
6	Edit	Elective	Correct title of UEENEEJ196A - Operate Ammonia Refrigeration Plant	40

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Description

Scope
This qualification provides competencies to select components, install, set up, test, fault find, repair and maintain refrigeration systems and equipment that apply to food storage and preservation, air conditioning and air distribution equipment in buildings and premises. It includes regulatory requirements for purchasing and handling refrigerants.

Note:
The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 60 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting points**
UEENEEC025B	Participate in refrigeration and air conditioning work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment	80
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test	60

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting points**
	refrigerants	
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations	20
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components	40
UEENEEJ113A	Commission air conditioning and refrigeration systems	40
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	60
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20
Total points in core		**1000**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 60 points from the following groups:

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Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	30
B	**Qualification Elective Units** You may select all your elective units from this Group	30	60

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Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 30		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
CPCPCM2043A	Carry out WHS requirements	40
CPCPMS3035A	Install and test ducting systems	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 30 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 30 You may select all your elective units from this Group		**Weighting Points**
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ114A	Resolve problems in hydronic systems	40
UEENEEJ115A	Resolve problems in beverage dispensers	40
UEENEEJ116A	Resolve problems in transport refrigeration systems	20
UEENEEJ117A	Resolve problems in ultra-low temperature refrigeration systems	20
UEENEEJ118A	Resolve problems in post mix refrigeration systems	20
UEENEEJ119A	Resolve problems in ice making systems	20
UEENEEJ120A	Resolve problems in industrial refrigeration systems	20
UEENEEJ166A	Resolve problems in dairy refrigeration systems	20
UEENEEJ167A	Resolve problems in central plant air conditioning systems	40
UEENEEJ168A	Maintain microbial control of refrigeration and air conditioning systems	20
UEENEEJ171A	Resolve problems in refrigerated beverage vending cabinets	20
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10
UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	20
UEENEEJ176A	Install and commission hydrocarbon refrigeration systems, components and associated equipment	20
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant	10
UEENEEJ179A	Repair and service ammonia refrigeration systems	20

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UEENEEJ180A	Install and commission ammonia refrigeration systems, components and associated equipment	20
UEENEEJ182A	Repair and service secondary refrigeration systems	20
UEENEEJ184A	Apply safety awareness and legal requirements for carbon dioxide refrigerant	10
UEENEEJ185A	Repair and service carbon dioxide refrigeration systems	20
UEENEEJ186A	Install and commission carbon dioxide refrigeration systems, components and associated equipment	20
UEENEEJ188A	Repair and service self contained carbon dioxide refrigeration and heat pump systems	20
UEENEEJ196A	Operate Ammonia Refrigeration Plant	40

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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UEE33011 Certificate III in Electrical Fitting

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UETTDRIS67A Solve problems in energy supply network equipment	80
2	Add	Group B	UETTDRIS68A Solve problems in energy supply network protection equipment and systems	40
2	Add	Group B	UETTDRIS44A Perform HV field switching operation to a given schedule	60
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	HLTFA311A Apply first aid	10
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10

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4	Update	Elective	HLTAID003 - Provide first aid	10
4	Edit	Core	Correct title of UEENEEC020B - Participate in electrical work and competency development activities	60
4	Edit	Core	Correct title ofUEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEG199A - Conduct compliance and functional verification of electrical apparatus and existing circuits	40
4	Edit	Core	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
4	Edit	Elective	Correct title of UEENEEA110A - Assemble, mount and connect control gear and switchgear	40
4	Edit	Elective	Correct title of UEENEEA112A - Fabricate and assemble bus bars	60
4	Edit	Elective	Correct title of UEENEEA113A - Mount and wire control panel equipment	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of Correct title of UEENEEG110A - Find and repair faults in LV d.c. electrical apparatus and circuits	60
4	Edit	Elective	Correct title of UEENEEG116A - Diagnose and rectify faults in traction lift systems	80
4	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG129A - Overhaul and repair major switchgear and controlgear	60

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4	Edit	Elective	Correct title of UEENEEG153A - Rewind three phase low voltage induction machines	60
4	Edit	Elective	Correct title of UEENEEG159A - Conduct mechanical tests on electrical machines and components	40
4	Edit	Elective	Correct title of UEENEEG164A - Repair and maintain mechanical components of electrical machines	40
4	Edit	Elective	Correct title of UEENEEG165A - Maintain and service traction lifts systems and equipment	40
4	Edit	Elective	Correct title of UEENEEG166A - Install and maintain escalators, moving walks and treadways	40
4	Edit	Elective	Correct title of UEENEEG167A - Align and install traction lift equipment	20
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components -	40
4	Edit	Elective	Correct title of UEENEEI101A - - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI107A - Install instrumentation and control cabling and tubing	20
4	Edit	Elective	Correct title of UEENEEI108A - - Install instrumentation and control apparatus and associated equipment	20
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEJ153A - Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
4	Edit	Elective	Correct title of UEENEEJ162A - Recover, pressure test, evacuate, charge and leak test refrigerants -	50

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			appliances	
4	Edit	Elective	Correct title of UEENEEN104A - Test copper rail signalling cables	20
4	Edit	Elective	Correct title of UEENEEP010A - Disconnect - reconnect appliances connected to low voltage installation wiring	60
4	Edit	Elective	Correct title of UEENEEP011A - Disconnect - reconnect neon signs connected to low voltage installation wiring	60
4	Edit	Elective	Correct title of UEENEEP014A - Disconnect – reconnect water heaters connected to low voltage installation wiring	60
4	Edit	Elective	Correct title of UEENEEP021A - Disconnect - reconnect explosion-protected appliances and control devices connected to low voltage installation wiring	60
4	Edit	Elective	Correct title of UEENEEP023A - HV Flexible Cables and Plugs	40
4	Edit	Elective	Correct title of UETTDRIS43A - Perform low voltage field switching operation to a given schedule	50
4	Edit	Elective	Correct title of UETTDRIS44A - Perform HV field switching operation to a given schedule	40

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Description

Scope

This qualification provides competencies to manufacture, fit, assemble, erect, operate, test, fault find, alter, repair electrical equipment and includes electrical wiring work only if that work is associated with assembling, maintaining, terminating or altering the wiring between electrical components within a plant or machinery. An electrical fitter is not authorised to install any electrical wiring systems within an electrical installation as prescribed by definitions contained in AS/NZS 3000.

Electrical equipment means any appliance, article, accessory, wire, fitting, cable, conduit or apparatus that generates, uses, conveys or controls (or that is intended to generate, use, convey or control) electricity above extra low voltage.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 240 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEC020B	Participate in electrical work and competency development activities	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG106A	Terminate cables, cords and accessories for low	40

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	voltage circuits	
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG199A	Conduct compliance and functional verification of electrical apparatus and existing circuits	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
Total points in core		**820**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 240 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units** You may select all your elective units from this Group	180	240

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20

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UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use basic computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
HLTAID003	Provide first aid	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 3. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units Complete units to a minimum weighting of 180 You may select all your elective units from this Group		**Weighting Points**
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40
UEENEEA112A	Fabricate and assemble bus bars	60
UEENEEA113A	Mount and wire control panel equipment	40
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF115A	Assemble and connect telecommunication frames and cabinets	60
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEG150A	Wind electrical coils	40
UEENEEG151A	Place and connect electrical coils	40
UEENEEG152A	Rewind single phase machines	40
UEENEEG153A	Rewind three phase low voltage induction machines	60

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UEENEEG154A	Rewind LV direct current machines	60
UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEG165A	Maintain and service traction lifts systems and equipment	40
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40
UEENEEG167A	Align and install traction lift equipment	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI107A	Install instrumentation and control cabling and tubing	20

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UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ105A	Position, assemble and start up single head split air conditioning and water heating heat pump systems	70
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60
UEENEEJ151A	Service small electrical appliances and power tools	60
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ154A	Find and rectify faults in appliance control systems and devices	60
UEENEEJ155A	Service refrigeration appliances	60
UEENEEJ156A	Service clothes washing machines and dryers	40
UEENEEJ157A	Service electrical heating appliances	60
UEENEEJ158A	Service dishwasher machines	40
UEENEEJ159A	Service gas heating appliances	40
UEENEEJ162A	Recover, pressure test, evacuate, charge and leak test refrigerants - appliances	50
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70

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UEENEEJ173A	Service and repair microwave ovens	40
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40
UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances	50
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM031A	Overhaul and repair of explosion-protected equipment — coal mining	60
UEENEEM032A	Overhaul and repair of explosion-protected equipment — flameproof enclosures	60
UEENEEM033A	Overhaul and repair of explosion-protected equipment — gas atmospheres	60
UEENEEM034A	Overhaul and repair of explosion-protected equipment — dust atmospheres	40
UEENEEM060A	Carry out overhaul and repair of explosion-protected equipment — coal mining	60
UEENEEM061A	Carry out overhaul and repair of explosion-protected equipment — flameproof enclosures	60

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UEENEEM062A	Carry out overhaul and repair of explosion-protected equipment — gas atmospheres	60
UEENEEM063A	Carry out overhaul and repair of explosion-protected equipment — dust atmospheres	60
UEENEEM070A	Repair reeling, trailing and flexible cables	60
UEENEEM071A	Test reeling, trailing and flexible cables	60
UEENEEM072A	Inspect and fit plugs/couplers for reeling, trailing and flexible cables	60
UEENEEM073A	Verify compliance of repaired reeling, trailing and flexible cables	60
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
UEENEEN102A	Assemble and wire internal electrical rail signalling equipment	30
UEENEEN104A	Test copper rail signalling cables	20
UEENEEN121A	Repair rail signalling power and control cables	40
UEENEEP010A	Disconnect - reconnect appliances connected to low voltage installation wiring	60
UEENEEP011A	Disconnect - reconnect neon signs connected to low voltage installation wiring	60
UEENEEP014A	Disconnect - reconnect water heaters connected to low voltage installation wiring	60
UEENEEP016A	Locate and rectify faults in low voltage appliances using set procedures	20
UEENEEP019A	Locate and rectify faults in low voltage water heaters using set procedures	20
UEENEEP021A	Disconnect - reconnect explosion-protected appliances and control devices connected to low	60

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	voltage installation wiring	
UEENEEP022A	Disconnect and reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles	60
UEENEEP023A	HV Flexible Cables and Plugs	40
UETTDRIS43A	Perform low voltage field switching operation to a given schedule	50
UETTDRIS44A	Perform HV field switching operation to a given schedule	40
UETTDRIS47A	Sample, test, filter and reinstate insulating oil	40
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40
UETTDRSB29A	Maintain capacitor bank equipment for voltage regulation	40
UETTDRSB39A	Perform power system substation switching operation to a given schedule	50

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE40111 Certificate IV in Computer Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UETTDRIS67A Solve problems in energy supply network equipment	80
2	Add	Group B	UETTDRIS68A Solve problems in energy supply network protection equipment and systems	40
2	Add	Group B	UETTDRIS44A Perform HV field switching operation to a given schedule	60
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Remove	Group D	UEENEED115A - Administer computer networks	80
4	Remove	Group C	UEENEEH189A Design electronic printed circuit boards	40
4	Edit	Core	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20

Description

Scope

This qualification provides competencies to select, install, commission, fault find and maintain data processing, communications and control aspects of systems used for monitoring and control of systems for access, surveillance, safety and effective operation of manufacturing, buildings, structures, premises and precincts.

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Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 680 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20

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UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**600**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 680 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	220
B	**Qualification Elective Units**	0	500
C	**Qualification Elective Units** You may select all your elective units from this Group	180	680

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20

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UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
ICTTEN4210A	Implement and troubleshoot enterprise routers and switches	100
ICTTEN4211A	Design, install and configure an internetwork	100
ICTTEN4212A	Apply advanced routing protocols to network design	80
ICTTEN4213A	Configure and troubleshoot advanced network switching	80
ICTTEN4214A	Install and maintain a wide area network	80
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 220 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 500		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA106A	Use lead-free soldering techniques	40
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF107A	Set up and configure the wireless capabilities of	40

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	communications and data storage devices	
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

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Group C – Qualification Elective Units You must complete units to a minimum weighting of 180 You may select all your elective units from this Group		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED103A	Evaluate and modify object oriented code programs	40
UEENEED113A	Install and administer Unix based networked computers	80
UEENEED116A	Develop computer network services	120
UEENEED117A	Install and configure network systems for internetworking	120
UEENEED124A	Integrate multiple computer operating systems on a client server local area network	80
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEI155A	Develop structured programs to control external devices	40

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE40211 Certificate IV in Electrical - Data and Voice Communications

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80
4	Edit	Elective	Correct title of UEENEEE009B - Comply with scheduled and preventative maintenance program processes	20
4	Edit	Elective	Correct title of UEENEEE020B - Provide basic instruction in the use of electrotechnology apparatus	20
4	Edit	Elective	Correct title ofUEENEEE114A - Supervise and	40

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			coordinate energy sector work activities	
4	Edit	Elective	Correct title of UEENEEE192A - Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
4	Edit	Elective	Correct title of UEENEEF105A - Install and modify optical fibre performance data communication cabling	40
4	Edit	Elective	Correct title of UEENEEF106A - Solve problems in voice and data communications circuits	40
4	Edit	Elective	Correct title of UEENEEF107A - Set up and configure the wireless capabilities of communications and data storage devices	40
4	Edit	Elective	Correct title of UEENEEF108A - Select and arrange equipment for wireless communication networks	40
4	Edit	Elective	Correct title of UEENEEF109A - Install and connect data and voice communication equipment	40
4	Edit	Elective	Correct title of UEENEEF110A - Select and arrange data and voice equipment for local area networks	40
4	Edit	Elective	Correct title of UEENEEF111A - Test, report and rectify faults in data and voice installations	40
4	Edit	Elective	Correct title of UEENEEF112A - Install aerial telecommunication cables	40

Description

Scope

This qualification provides competencies to select, install, commission, fault find and maintain electrical and communications systems and equipment in building and premises. It includes ERAC requirements for an ‘Electrician’s licence’ and ACMA requirements for Open Cabler registration.

Pathways Information

Not applicable.

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Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**1120**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:

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Group		Minimum points	Maximum points
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	80
B	**Qualification Elective Units**	0	80
C	**Qualification Elective Units** You may select all your elective units from this Group	80	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at	Up to 80 points

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	AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF106A	Solve problems in voice and data communications circuits	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEF111A	Test, report and rectify faults in data and voice installations	40
UEENEEF112A	Install aerial telecommunication cables	40
UEENEEF113A	Install underground communication cables	40
UEENEEF114A	Set up and configure basic data communication systems	40
UEENEEF115A	Assemble and connect telecommunication frames and cabinets	60
UEENEEI140A	Plan the electrical installation of integrated systems	20

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UEENEEI141A	Develop electrical integrated systems	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 80 You may select all your elective units from this Group		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEC009B	Provide quotations for inspection and compliance audit services	80
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen	20
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20
UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE40311 Certificate IV in Installation Inspection and Audits

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG113A - Install and maintain emergency safety systems	60
4	Edit	Elective	Correct title of UEENEEG116A - Diagnose and rectify faults in traction lift systems	80
4	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG120A - Select and arrange equipment for special LV electrical installations	60

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4	Edit	Elective	Correct title of UEENEEG125A - Plan electrical installations with a low voltage demand up to 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG126A - Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40
4	Edit	Elective	Correct title of UEENEEG128A - Plan low voltage switchboard and control panel layouts	40
4	Edit	Elective	Correct title of UEENEEG132A - Carry out low voltage electrical field testing and report findings	60
4	Edit	Elective	Correct title of UEENEEG168A - Diagnose and rectify faults in complex lift systems	40
4	Edit	Elective	Correct title of UEENEEG172A - Investigate and report on electrical incidents and causes	60
4	Edit	Elective	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEK148A - Install, configure and commission LV grid connected photovoltaic power systems	40

Description

Scope

This qualification provides competencies in mandatory and contractual inspections of electrical systems and auditing of entities for compliance with electrical safety requirements. It includes ERAC requirements for an ‘Electrician’s licence’.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

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Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 220 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60

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UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**1060**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 220 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	80
B	**Qualification Elective Units**	0	110
C	**Qualification Elective Units** You may select all your elective units from this Group	110	220

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 80 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 110		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEG113A	Install and maintain emergency safety systems	60
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG120A	Select and arrange equipment for special LV electrical installations	60
UEENEEG126A	Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40

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UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 110 You may select all your elective units from this Group		**Weighting Points**
UEENEEG121A	Verify compliance and functionality of special LV electrical installations	40
UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60
UEENEEG125A	Plan LV electrical installations with a demand up to 400A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEG172A	Investigate and report on electrical incidents and causes	60
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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Custom Content Section

Not applicable.

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UEE40411 Certificate IV in Electrical - Instrumentation

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI106A Set up and adjust PID control loops	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI110A Set up and adjust advanced PID process control loops	40
3	Edit	Group C	Edit Name to reflect correct Unit title	60

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			UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Core	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEI107A - Install instrumentation and control cabling and tubing	20
4	Edit	Elective	Correct title of UEENEEI108A - Install instrumentation and control apparatus and associated equipment	20
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20

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4	Edit	Elective	Correct title of UEENEEI119A - Set up industrial field control devices	60
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60

Description

Scope

This qualification provides competencies to select, install, commission, fault find and maintain electrical and instrumentation equipment in buildings and premises and instrumentation systems and core instrumentation equipment for process and control. It includes ERAC requirements for an 'Electrician's licence'.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 120 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60

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UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**1160**

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 120 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units**	0	60
C	**Qualification Elective Units** You may select all your elective units from this Group	60	120

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10

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	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI106A	Set up and adjust PID control loops	40
UEENEEI107A	Install instrumentation and control cabling and tubing	20
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI110A	Set up and adjust advanced PID process control loops	40
UEENEEI111A	Find and rectify faults in process final control elements	40
UEENEEI113A	Setup and configure human-machine interface (HMI) and industrial networks	60
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20

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UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40
UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM076A	Use and maintain the integrity of a portable gas	20

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	detection device	
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 60 You may select all your elective units from this Group		**Weighting Points**
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.

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2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE40511 Certificate IV in Electrical - Air-conditioning Split Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEJ102A - Prepare and connect refrigerant tubing and fittings	30
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEE114A - Supervise and coordinate energy sector work activities	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20

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Description

Scope

This qualification provides competencies to select, install, commission, fault find and maintain electrical systems and equipment in buildings and premises and split air-conditioning systems to a prescribed routine where the maximum plant capacity for each system does not exceed 18 kWr. It includes ERAC requirements for an 'Electrician's licence' and regulatory requirements for purchasing and handling refrigerants for split systems.

Split systems include wall hung, floor and ceiling suspended, cassette and ducted fan coil split systems. This qualification excludes competencies required for service, repair, maintenance, or the safe and proper installation of commercial refrigeration and air conditioning plant and equipment.

Note:

1. The letter "r" denotes "refrigeration" or cooling capacity, not electrical input power.
2. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 and the Ozone Protection and Synthetic Gas Management Regulations apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60

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UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ105A	Position, assemble and start up single head split air conditioning and water heating heat pump systems	70
UEENEEJ172A	Recover, pressure test, evacuate, charge and leak test refrigerants - split systems	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**1120**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	80
B	**Qualification Elective Units**	0	80
C	**Qualification Elective Units** You may select all your elective units from this Group	80	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting	Up to 80 points

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	will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

Group B – Qualification Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10

Group C – Qualification Elective Units You must complete units to a minimum weighting of 80 You may select all your elective units from this Group		**Weighting Points**
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40
UEENEEJ192A	Analyse the psychrometric performance of	50

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	HVAC/R systems	
UEENEEJ193A	Analyse the thermodynamic performance of HVAC/R systems	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE40611 Certificate IV in Electrotechnology - Systems Electrician

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UETTDRIS67A Solve problems in energy supply network equipment	80
2	Add	Group B	UETTDRIS68A Solve problems in energy supply network protection equipment and systems	40
2	Add	Group B	UETTDRIS44A Perform HV field switching operation to a given schedule	60
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	

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2	Update	Group A	HLTCPR211A Perform CPR	10

3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Elective	Correct title of UEENEEE121A - Plan an integrated cabling installation system	40
4	Edit	Elective	Correct title of UEENEEG110A - Find and repair faults in LV d.c. electrical apparatus and circuits	60

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4	Edit	Elective	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of UEENEEG113A - Install and maintain emergency safety systems	60
4	Edit	Elective	Correct title of UEENEEG116A - Diagnose and rectify faults in traction lift systems	80
4	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG120A - Select and arrange equipment for special LV electrical installations	60
4	Edit	Elective	Correct title of UEENEEG125A - Plan electrical installations with a low voltage demand up to 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG126A - Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40
4	Edit	Elective	Correct title of UEENEEG128A - Plan low voltage switchboard and control panel layouts	40
4	Edit	Elective	Correct title of UEENEEG129A - Overhaul and repair major switchgear and controlgear	60
4	Edit	Elective	Correct title of UEENEEG132A - Carry out low voltage electrical field testing and report findings	60
4	Edit	Elective	Correct title of UEENEEG153A - Rewind three phase low voltage induction machines	60
4	Edit	Elective	Correct title of UEENEEG155A - Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
4	Edit	Elective	Correct title of UEENEEG156A - Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
4	Edit	Elective	Correct title of UEENEEG159A - Conduct mechanical tests on electrical machines and components	40
4	Edit	Elective	Correct title of UEENEEG164A - Repair and	40

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			maintain mechanical components of electrical machines	
4	Edit	Elective	Correct title of UEENEEG165A - Maintain and service traction lifts systems and equipment	40
4	Edit	Elective	Correct title of UEENEEG166A - Install and maintain escalators, moving walks and treadways	40
4	Edit	Elective	Correct title of UEENEEG167A - Align and install traction lift equipment	20
4	Edit	Elective	Correct title of UEENEEG168A - Diagnose and rectify faults in complex lift systems	40
4	Edit	Elective	Correct title of UEENEEG172A - Investigate and report on electrical incidents and causes	60
4	Edit	Elective	Correct title of UEENEEG177A - Select low voltage power factor correction equipment	40
4	Edit	Elective	Correct title of UEENEEG185A - Select effective and efficient light sources and luminaries for given locations and designs	60
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEH150A - Assemble and set up basic security systems	80
4	Edit	Elective	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI119A - Set up industrial field control devices	60
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80

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4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEK135A - Design grid connected photovoltaic power supply systems	60
4	Edit	Elective	Correct title of UEENEEK148A - Install, configure and commission LV grid connected photovoltaic power systems	60
4	Edit	Elective	Correct title of UEENEEK153A - Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
4	Edit	Elective	Correct title of UEENEEK154A - Assess energy loads and uses for energy efficiency in commercial facilities	40
4	Edit	Elective	Correct title of UEENEEK155A - Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40
4	Edit	Elective	Correct title of UEENEEN104A - Test copper rail signalling cables	20

5	Remove	Group C	UEENEEG197A - Apply currency of safe working practices and compliance verification of electrical installations	20
5	Remove	Group C	UEENEEG198A - Apply compliance requirements to all aspects of electrical work	20

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Description

Scope

This qualification provides competencies to select, install, commission, fault find and maintain electrical systems and equipment with options, typically in Explosion protection; Electrical machines; Electrical inspection; Safety auditing; Contracting; Lifts; Energy supply/distribution. It includes ERAC requirements for an 'Electrician's licence'.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 320 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60

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UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**960**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 320 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	100
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units** You may select all your elective units from this Group	220	320

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	Up to 100 points

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	Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40
UEENEEA112A	Fabricate and assemble bus bars	40
UEENEEA113A	Mount and wire control panel equipment	40
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG113A	Install and maintain emergency safety systems	60
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG120A	Select and arrange equipment for special LV electrical installations	60
UEENEEG126A	Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEG150A	Wind electrical coils	40

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UEENEEG151A	Place and connect electrical coils	40
UEENEEG152A	Rewind single phase machines	40
UEENEEG153A	Rewind three phase low voltage induction machines	60
UEENEEG154A	Rewind LV direct current machines	60
UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEG165A	Maintain and service traction lifts systems and equipment	40
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40
UEENEEG167A	Align and install traction lift equipment	20
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEG189A	Install and maintain emergency lighting systems	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20
UEENEEI101A	Use instrumentation drawings, specification,	40

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	standards and equipment manuals	
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60

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UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40
UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
UEENEEN102A	Assemble and wire internal electrical rail signalling equipment	30
UEENEEN103A	Install and maintain rail track circuit leads and bonds	30

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UEENEEN104A	Test copper rail signalling cables	20
UEENEEN121A	Repair rail signalling power and control cables	40
UETTDRIS43A	Perform low voltage field switching operation to a given schedule.	50
UETTDRIS44A	Perform HV field switching operation to a given schedule	50
UETTDRIS47A	Sample, test, filter and reinstate insulating oil	40
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40
UETTDRSB23A	Install and maintain substation direct current systems	30
UETTDRSB29A	Maintain capacitor bank equipment for voltage regulation	40
UETTDRSB39A	Perform power system substation switching operation to a given schedule	50

Group C – Qualification Elective Units You must complete units to a minimum weighting of 220 You may select all your elective units from this Group		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE185A	Write work activity reports	20
UEENEEG076A	Install and replace low voltage current transformer metering	20
UEENEEG121A	Verify compliance and functionality of special LV electrical installations	40
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40

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UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60
UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
UEENEEG156A	Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
UEENEEG158A	Conduct electrical tests on HV electrical machines	60
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEG172A	Investigate and report on electrical incidents and causes	60
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80
UEENEEG177A	Select low voltage power factor correction equipment	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEG184A	Provide photometric data for illumination system design	60
UEENEEG185A	Select effective and efficient light sources and luminaries for given locations and designs	60
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings	20
UEENEEG188A	Prepare quotations for the supply of effective and efficient lighting products for lighting projects	20
UEENEEI142A	Develop an electrical integrated system interface for	20

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	access through a touch screen	
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20
UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEK135A	Design grid connected photovoltaic power supply systems	60
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations	20
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
UEENEEK154A	Assess energy loads and uses for energy efficiency in	40

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	commercial facilities	
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE40711 Certificate IV in Electronics and Communications

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
2	Add	Group B	UEENEEI150A Develop, enter and verify discrete control programs for programmable controllers	60
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Update	Group A	MSS402001A Apply competitive systems and practices	20
2	Update	Group A	MSS402021A Apply Just in Time procedures	20
2	Update	Group A	MSS402080A Undertake root cause analysis	20
2	Update	Group A	MSS402081A Contribute to the application of a proactive maintenance strategy	20
2	Update	Group A	MSS402040A Apply 5S procedures	20
2	Update	Group A	MSS402020A Apply quick changeover procedures	20

3	Add	Group B	UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

4	Remove	Group C	UEENEEH189A Design electronic printed circuit boards	40

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4	Edit	Core	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20

Description

Scope
This qualification provides competencies in audio/video, data systems and computer/network hardware, medical applications and communication aspects of electronic i.e. transmitters, communications medium/channel, receivers, attenuation, noise reduction. It includes detection/surveillance.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 560 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH138A	Fault find and repair complex power supplies	40

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UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH146A	Solve fundamental electronic communications system problems	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**720**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 560 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	220
B	**Qualification Elective Units**	0	360
C	**Qualification Elective Units** You may select all your elective units from this Group	200	560

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20

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UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
ICTTEN3056A	Install telecommunications network equipment	40
MSS402001A	Apply competitive systems and practices	20
MSS402020A	Apply quick changeover procedures	20
MSS402021A	Apply Just in Time procedures	20
MSS402040A	Apply 5S procedures	20
MSS402080A	Undertake root cause analysis	20
MSS402081A	Contribute to the application of a proactive maintenance strategy	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 220 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 360		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA103A	Set up and check electronic component assembly machines	40
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	20
UEENEEA106A	Use lead-free soldering techniques	40
UEENEEB101A	Operate and maintain amateur radio communication stations	40
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for	40

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	extra-low voltage (ELV) circuits	
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF106A	Solve problems in voice and data communications circuits	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEF111A	Test, report and rectify faults in data and voice installations	40
UEENEEF114A	Set up and configure basic data communication systems	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH104A	Set up and test residential video/audio equipment	40

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UEENEEH105A	Verify functionality and compliance of custom electronic installations	40
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises	120
UEENEEH107A	Repair predictable faults in general electronic apparatus	40
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	60
UEENEEH109A	Set up and test gaming and game equipment	60
UEENEEH110A	Install commercial video/audio system components	120
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus	40
UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
UEENEEH118A	Fault find and repair electronic apparatus	40
UEENEEH119A	Repair predictable faults in television receivers	120
UEENEEH120A	Fault find and repair gaming and games equipment	80
UEENEEH121A	Fault find and repair high volume office equipment	120
UEENEEH122A	Fault find and repair remote control apparatus	60
UEENEEH123A	Fault find and repair microwave heating apparatus	40
UEENEEH124A	Repair predictable faults in audio components	40
UEENEEH127A	Set up and adjust commercial radio frequency (RF) transmission and reception systems	60
UEENEEH128A	Install and test microwave antennae and waveguides	60
UEENEEH142A	Solve oscillator problems	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100

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UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH154A	Program and commission commercial security systems	60
UEENEEH155A	Program and commission commercial access control security systems	60
UEENEEH156A	Program and commission commercial security closed circuit television systems	60
UEENEEH161A	Install fire detection and warning system apparatus	40
UEENEEH162A	Verify compliance and functionality of fire protection system installations	60
UEENEEH163A	Enter and verify programs for fire protection systems	40
UEENEEH164A	Commission large fire protection systems	40
UEENEEH165A	Troubleshoot fire protection systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100
UEENEEH171A	Troubleshoot faults in television receivers	120
UEENEEH172A	Troubleshoot communication systems	80
UEENEEH173A	Troubleshoot professional audio reproduction components	120
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

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Group C – Qualification Elective Units You must complete units to a minimum weighting of 200 You may select all your elective units from this Group		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED103A	Evaluate and modify object oriented code programs	40
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEH129A	Fault find and repair navigation systems	60
UEENEEH130A	Fault find and repair satellite-based surveillance and observation systems	60
UEENEEH131A	Fault find and repair radar apparatus and systems	120
UEENEEH132A	Fault find and repair global positioning systems	60
UEENEEH133A	Fault find and repair telecommunication apparatus and systems	60
UEENEEH134A	Fault find and repair electronic medical equipment	120
UEENEEH135A	Design custom electronic equipment installations	120
UEENEEH136A	Design commercial video/audio installations	120
UEENEEH137A	Program and commission commercial video/audio systems	40
UEENEEH140A	Fault find and repair sonar apparatus and systems	120
UEENEEH153A	Program and test large security systems	120
UEENEEH157A	Develop basic plans for integrating security systems	40

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UEENEEH175A	Troubleshooting in security system installations	60
UEENEEH176A	Diagnose and rectify faults in electronic display circuits	60
UEENEEH177A	Diagnose and rectify faults in recording and replay equipment	60
UEENEEH178A	Diagnose and rectify faults in camera circuits and equipment	60
UEENEEH179A	Diagnose and rectify faults in digital television circuits and apparatus	80
UEENEEH180A	Diagnose and rectify faults in digital transmission circuits and systems	80
UEENEEH186A	Commission satellite and microwave communication systems	40
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI155A	Develop structured programs to control external devices	40

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE40811 Certificate IV in Electrical - Fire Protection Control Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	CPPFES2043A Prevent ozone depleting substance and synthetic greenhouse gas emissions	10
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEH161A - Install fire detection and warning system apparatus	40
4	Edit	Core	Correct title of UEENEEH162A - Verify compliance and functionality of fire protection system installations	60

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4	Edit	Core	Correct title of UEENEEH163A - Enter and verify programs for fire protection systems	40
4	Edit	Core	Correct title of UEENEEH164A - Commission large fire protection systems	40
4	Edit	Core	Correct title of UEENEEH165A - Troubleshoot fire protection systems	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG113A - Install and maintain emergency safety systems	60
4	Edit	Elective	Correct title of UEENEEG172A - Investigate and report on electrical incidents and causes	60
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI151A - Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
4	Edit	Elective	Correct title of UEENEEM024A - Install explosion-protected equipment and wiring systems - gas atmospheres	40

Description

Scope

This qualification provides competencies to select, install, commission, fault find and maintain fire protection control systems in buildings. It includes ERAC requirements for an ‘Electrician’s licence’.

Pathways Information

Not applicable.

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Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 100 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60

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UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEH161A	Install fire detection and warning system apparatus	40
UEENEEH162A	Verify compliance and functionality of fire protection system installations	60
UEENEEH163A	Enter and verify programs for fire protection systems	40
UEENEEH164A	Commission large fire protection systems	40
UEENEEH165A	Troubleshoot fire protection systems	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**1180**

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 100 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units**	0	60
C	**Qualification Elective Units** You may select all your elective units from this Group	40	100

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10

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CPPFES2043A	Prevent ozone depleting substance and synthetic greenhouse gas emissions	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEG113A	Install and maintain emergency safety systems	60
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH138A	Fault find and repair complex power supplies	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 40 You may select all your elective units from this Group		**Weighting Points**
UEENEEG121A	Verify compliance and functionality of special LV electrical installations	40

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UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40
UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60
UEENEEG172A	Investigate and report on electrical incidents and causes	60
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEM042A	Install explosion-protected equipment and wiring systems - gas atmospheres	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE40911 Certificate IV in Industrial Electronics and Control

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UEENEEH150A Assemble and set up basic security systems	80
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Update	Group A	HLTCPR211A Perform CPR	10

3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy	20

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			sector environmental and sustainable policies and procedures	

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG110A - Find and repair faults in LV d.c. electrical apparatus and circuits	60
4	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG132A - Carry out low voltage electrical field testing and report findings	60
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI119A - Set up industrial field control devices	60
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60

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4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60

Description

Scope

This qualification provides competencies to select, install, commission, fault find and maintain equipment and systems for the control of plant, machines and processes. It includes ERAC requirements for an 'Electrician's licence'.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 200 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60

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UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**1080**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 200 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	100
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units** You may select all your elective units from this Group	100	200

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	Up to 100 points

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	Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40

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UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 100 You may select all your elective units from this Group		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI119A	Set up industrial field control devices	60

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UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE41011 Certificate IV in Energy Management and Control

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate,	40

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			assemble and dismantle utilities industry components	
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEE121A - Plan an integrated cabling installation system	40
4	Edit	Elective	Correct title of UEENEEG113A - Install and maintain emergency safety systems	60
4	Edit	Elective	Correct title of UEENEEG125A - Plan electrical installations with a low voltage demand up to 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG128A - Plan low voltage switchboard and control panel layouts	40
4	Edit	Elective	Correct title of UEENEEG168A - Diagnose and rectify faults in complex lift systems	40
4	Edit	Elective	Correct title of UEENEEG172A - Investigate and report on electrical incidents and causes	60
4	Edit	Elective	Correct title of UEENEEG177A - Select low voltage power factor correction equipment	60
4	Edit	Elective	Correct title of UEENEEG185A - Select effective and efficient light sources and luminaries for given locations and designs	60
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEK153A - Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
4	Edit	Elective	Correct title of UEENEEK154A - Assess energy loads and uses for energy efficiency in commercial facilities	40

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4	Edit	Elective	Correct title of UEENEEK155A - Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

Description

Scope

This qualification provides competencies to develop strategies for the reduction of energy in buildings and to recommend changes in the way in which energy is controlled in the building either by the installation of new control equipment or by the modification or re-programming of that existing. It includes ERAC requirements for an 'Electrician's licence'.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 300 points in accordance with the Elective Competency Standard Units table below.

Note 1: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60

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UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations	20
Total points in core		**980**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 300 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	100
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units** You may select all your elective units from this Group	200	300

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	Up to 100 points

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	Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEG113A	Install and maintain emergency safety systems	60
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEG189A	Install and maintain emergency lighting systems	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI141A	Develop electrical integrated systems	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40

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UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60

Group C – Qualification Elective Units You must complete units to a minimum weighting of 200 You may select all your elective units from this Group		**Weighting Points**
UEENEEE073B	Write specifications for refrigeration and air conditioning engineering projects	40
UEENEEG076A	Install and replace low voltage current transformer metering	20
UEENEEG121A	Verify compliance and functionality of special LV electrical installations	40
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40
UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEG172A	Investigate and produce reports on electrical incidents	60
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80

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UEENEEG177A	Select power factor correction equipment	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEG184A	Provide photometric data for illumination system design	60
UEENEEG185A	Select effective and efficient light sources and luminaries for given locations and designs	60
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings	20
UEENEEG188A	Prepare quotations for the supply of effective and efficient lighting products for lighting projects	20
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities	40
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE41111 Certificate IV in Electrical - Lift Systems

Modification History

Release	Action	Core/Elective	Details	Points
	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	

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2	Update	Group A	HLTCPR211A Perform CPR	10

3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEG116A - Diagnose and rectify faults in traction lift systems	80
4	Edit	Core	Correct title of UEENEEG168A - Diagnose and rectify faults in complex lift systems	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG110A - Find and repair faults in LV d.c. electrical apparatus and circuits	60
4	Edit	Elective	Correct title of UEENEEG165A - Maintain and service traction lifts systems and equipment	40
4	Edit	Elective	Correct title of UEENEEG166A - Install and maintain escalators, moving walks and treadways	40
4	Edit	Elective	Correct title of UEENEEG167A - Align and install traction lift equipment	20
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60

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4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60

Description

Scope
This qualification provides competencies to select, install, commission, fault find and maintain lifts, escalators and associated equipment. It includes ERAC requirements for an 'Electrician's licence'.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 80 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60

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UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**1200**

Elective Competency Standard Units

Complete Elective units to achieve a total of weighting of 80 points from the following groups:

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Group		Minimum points	Maximum points
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	20
B	**Qualification Elective Units**	0	20
C	**Qualification Elective Units** You may select all your elective units from this Group	60	60

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant	Up to 20 points

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	EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

Group B – Qualification Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEEF103A	Install and maintain telecommunication cabling for services in lifts	20
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG165A	Maintain and service traction lifts systems and equipment	40
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40
UEENEEG167A	Align and install traction lift equipment	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60

Group C – Qualification Elective Units Complete units to a maximum weighting of 60		**Weighting Points**
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60

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Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE41211 Certificate IV in Electrical - Rail Signalling

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Added Heading for Performance Criteria Element 2 and 3	
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEN106A - Install and maintain non-vital screen based control systems	20

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Description

Scope
This qualification provides competencies to install, certify, fault find and maintain rail signalling equipment and systems. This includes ERAC requirements for an 'Electrician's licence', performing like for like replacement, performing authorised installations and alterations, and applying emergency operational restriction. It excludes changing circuit principles, changing the design function and commissioning.
Note:
Commissioning is defined as the process to certify the signalling system to the enterprise standard. Certification is defined as the signing of certification documents by qualified, competent persons attesting to the design, product, or installation is in accordance with the specification requirements as verified by appropriate inspections and/or tests at equipment level.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 70 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40

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UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEN102A	Assemble and wire internal electrical rail signalling equipment	30
UEENEEN103A	Install and maintain rail track circuit leads and bonds	30
UEENEEN104A	Test copper rail signalling cables	20
UEENEEN105A	Install and maintain rail signalling power supplies	40
UEENEEN107A	Install and maintain active level crossing equipment	40
UEENEEN108A	Install and maintain power operated point actuating devices	40
UEENEEN109A	Install and maintain train detection equipment	40
UEENEEN111A	Install and maintain trackside signal and train protection equipment	40
UEENEEN112A	Install and maintain vital relay interlocking systems	40
UEENEEN118A	Find and repair rail signalling system faults	20

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UEENEEN121A	Repair rail signalling power and control cables	40
Total points in core		**1280**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 70 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	30
B	**Qualification Elective Units**	0	40
C	**Qualification Elective Units** You may select all your elective units from this Group	30	70

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 30		**Weighting Points**
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
TLIS2004A	Install and maintain rail bonding systems	40
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20

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UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 30 points

Group B – Qualification Elective Units You may complete units to a maximum weighting of 40		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED146A	Set up and configure basic local area network (LAN)	80

Group C – Qualification Elective Units You must complete units to a minimum weighting of 30 You may select all your elective units from this Group		**Weighting Points**
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE152A	Observe safety practices are followed in the vicinity of isolated electrical cables	20
UEENEEN101A	Maintain mechanical rail signalling equipment and infrastructure	20
UEENEEN106A	Install and maintain non-vital screen based control systems	20

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UEENEEN110A	Install and maintain non-vital telemetry systems	40
UEENEEN114A	Install and maintain computer based interlocking rail systems	30
UEENEEN116A	Maintain electronic and microprocessor-based remote control systems	20
UEENEEN126A	Develop rail signalling system maintenance programs	20
UEENEEN127A	Decommission electrical and electro-mechanical rail signalling from service	20
UEENEEN128A	Test and commission rail power equipment	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE41511 Certificate IV in Video and Audio Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
4	Remove	Group C	UEENEEH189A Design electronic printed circuit boards	40
4	Edit	Elective	Correct title of UEENEEH101A - Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
4	Edit	Elective	Correct title of UEENEEH117A - Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
4	Edit	Elective	Correct title of UEENEEH174A - Troubleshoot audio - video recording equipment	120
4	Edit	Core	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	120

Description

Scope
This qualification provides competencies to service high end audio, video, display systems and HDTV.

Pathways Information

Not applicable.

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Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 440 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH119A	Repair predictable faults in television receivers	120

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UEENEEH138A	Fault find and repair complex power supplies	40
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH146A	Solve fundamental electronic communications system problems	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**840**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 440 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	220
B	**Qualification Elective Units**	0	220
C	**Qualification Elective Units** You may select all your elective units from this Group	220	440

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20

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UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 220 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA106A	Use lead-free soldering techniques	40
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120

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UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF106A	Solve problems in voice and data communications circuits	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEF111A	Test, report and rectify faults in data and voice installations	40
UEENEEF114A	Set up and configure basic data communication systems	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH104A	Set up and test residential video/audio equipment	40
UEENEEH105A	Verify functionality and compliance of custom electronic installations	40
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises	120
UEENEEH107A	Repair predictable faults in general electronic apparatus	40
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	60
UEENEEH109A	Set up and test gaming and game equipment	60
UEENEEH110A	Install commercial video/audio system components	120

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UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus	40
UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
UEENEEH118A	Fault find and repair electronic apparatus	40
UEENEEH120A	Fault find and repair gaming and games equipment	80
UEENEEH121A	Fault find and repair high volume office equipment	120
UEENEEH122A	Fault find and repair remote control apparatus	60
UEENEEH123A	Fault find and repair microwave heating apparatus	40
UEENEEH124A	Repair predictable faults in audio components	40
UEENEEH127A	Set up and adjust commercial radio frequency (RF) transmission and reception systems	60
UEENEEH128A	Install and test microwave antennae and waveguides	60
UEENEEH142A	Solve oscillator problems	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH154A	Program and commission commercial security systems	60
UEENEEH155A	Program and commission commercial access control security systems	60
UEENEEH156A	Program and commission commercial security closed circuit television systems	60
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100

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UEENEEH171A	Troubleshoot faults in television receivers	120
UEENEEH172A	Troubleshoot communication systems	80
UEENEEH173A	Troubleshoot professional audio reproduction components	120
UEENEEH174A	Troubleshoot audio - video recording equipment	120
UEENEEH187A	Solve problems in electronic musical equipment circuits	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 220 You may select all your elective units from this Group		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED103A	Evaluate and modify object oriented code programs	40
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEH133A	Fault find and repair telecommunication apparatus and systems	60
UEENEEH134A	Fault find and repair electronic medical equipment	120
UEENEEH135A	Design custom electronic equipment installations	120
UEENEEH136A	Design commercial video/audio installations	120
UEENEEH137A	Program and commission commercial video/audio systems	40
UEENEEH153A	Program and test large security systems	120
UEENEEH157A	Develop basic plans for integrating security systems	40

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UEENEEH175A	Troubleshooting in security system installations	60
UEENEEH176A	Diagnose and rectify faults in electronic display circuits	60
UEENEEH177A	Diagnose and rectify faults in recording and replay equipment	60
UEENEEH178A	Diagnose and rectify faults in camera circuits and equipment	60
UEENEEH179A	Diagnose and rectify faults in digital television circuits and apparatus	80
UEENEEH180A	Diagnose and rectify faults in digital transmission circuits and systems	80
UEENEEI155A	Develop structured programs to control external devices	40

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE41611 Certificate IV in Renewable Energy

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10

3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE108A - Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
4	Edit	Core	Correct title of UEENEEE119A - Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
4	Edit	Core	Correct title of UEENEEK128A - Solve problems in stand-alone renewable energy systems	60
4	Edit	Core	Correct title of UEENEEK149A - Verify compliance and functionality of a extra low voltage renewable energy installation	40

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4	Edit	Elective	Correct title of UEENEEC004B - Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEE114A - Supervise and coordinate energy sector work activities	40
4	Edit	Elective	Correct title of UEENEEE192A - Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
4	Edit	Elective	Correct title of UEENEEK110A - Co-ordinate maintenance of renewable energy (RE) apparatus and systems	20
4	Edit	Elective	Correct title of UEENEEK117A - Maintain and repair facilities associated with remote area essential service operations	120
4	Edit	Elective	Correct title of UEENEEK130A - Solve problems in wind energy conversion systems rated up to 10 kW	60
4	Edit	Elective	Correct title of UEENEEK134A - Install ELV stand-alone photovoltaic power systems	60
4	Edit	Elective	Correct title of UEENEEK135A - Design grid connected photovoltaic power supply systems	60
4	Edit	Elective	Correct title of UEENEEK143A - Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
4	Edit	Elective	Correct title of UEENEEP026A - Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

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Description

Scope

This qualification provides competencies to select, install, commission, fault find and maintain multiple renewable energy sources and equipment for control of energy use.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 540 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEK149A- Those holding a 'Certificate III in Renewable Energy – ELV qualification or equivalent' meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG101A	Solve problems in electromagnetic devices and related	60

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	circuits	
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	80
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK127A	Diagnose and rectify faults in renewable energy control systems	60
UEENEEK128A	Solve problems in stand-alone renewable energy systems	60
UEENEEK149A	Verify compliance and functionality of a extra low voltage renewable energy installation	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
	Total points in core	**740**

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 540 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	220
B	**Qualification Elective Units**	0	320
C	**Qualification Elective Units**	220	380

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or	

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	state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 220 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 320		**Weighting Points**
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK107A	Conduct checks in the demand side use of remote area power supplies (RAPS)	40
UEENEEK108A	Plan periodic maintenance schedules of remote area power supplies (RAPS)	40
UEENEEK109A	Attend to breakdowns in remote area power supplies (RAPS)	20
UEENEEK117A	Maintain and repair facilities associated with remote area essential service operations	120
UEENEEK120A	Maintain operation of remote area power generation plant	120
UEENEEK124A	Solve basic problems in micro hydro systems	20
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW	60
UEENEEK134A	Install ELV stand-alone photovoltaic power systems	60
UEENEEK137A	Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
UEENEEK143A	Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

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UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 220 and to a maximum of 380		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEK110A	Co-ordinate maintenance of renewable energy (RE) apparatus and systems	20
UEENEEK135A	Design grid connected photovoltaic power supply systems	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE41711 Certificate IV in Rail - Communications and Network Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEH127A - Set up and adjust commercial radio frequency (RF) transmission and reception systems	60
4	Edit	Elective	Correct title of UEENEEH129A - Fault find and repair navigation systems	60

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4	Edit	Elective	Correct title of UEENEEH137A - Program and commission commercial video/audio systems	40
4	Edit	Elective	Correct title of UEENEEH175A - Troubleshooting in security system installations	60
4	Edit	Elective	Correct title of UEENEEH176A - Diagnose and rectify faults in electronic display circuits	60
4	Edit	Elective	Correct title of UEENEEH177A - Diagnose and rectify faults in recording and replay equipment	60
4	Edit	Elective	Correct title of UEENEEH178A - Diagnose and rectify faults in camera circuits and equipment	60
4	Edit	Elective	Correct title of UEENEEH179A - Diagnose and rectify faults in digital television circuits and apparatus	80
4	Edit	Elective	Correct title of UEENEEH180A - Diagnose and rectify faults in digital transmission circuits and systems	80

Description

Scope
This qualification provides competencies to select, install, commission, fault find and maintain radio and dedicated telecommunications networks in rail systems.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

All the Core competency standard units, defined in the Core Competency Standard Units table below and

A combination of Elective competency standard units to achieve a total weighting of 560 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80

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UEENEEH138A	Fault find and repair complex power supplies	40
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**720**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 560 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	220
B	**Qualification Elective Units**	0	340
C	**Qualification Elective Units** You may select all your elective units from this Group	220	560

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20

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UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 220 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 340		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	60
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEH115A	Develop software solutions for microcontroller based systems	60

Group C – Qualification Elective Units You must complete units to a minimum weighting of 220 You may select all your elective units from this Group		**Weighting Points**
UEENEEH127A	Set up and adjust commercial radio frequency (RF) transmission and reception systems	60
UEENEEH129A	Fault find and repair navigation systems	60
UEENEEH137A	Program and commission commercial video/audio systems	40
UEENEEH175A	Troubleshooting in security system installations	60
UEENEEH176A	Diagnose and rectify faults in electronic display circuits	60

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UEENEEH177A	Diagnose and rectify faults in recording and replay equipment	60
UEENEEH178A	Diagnose and rectify faults in camera circuits and equipment	60
UEENEEH179A	Diagnose and rectify faults in digital television circuits and apparatus	80
UEENEEH180A	Diagnose and rectify faults in digital transmission circuits and systems	80

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE41911 Certificate IV in Electrical - Renewable Energy

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEK110A - Co-ordinate maintenance of renewable energy (RE) apparatus and systems	20
4	Edit	Elective	Correct title of UEENEEK128A - Solve problems in stand-alone renewable energy systems	60
4	Edit	Elective	Correct title of UEENEEK130A - Solve problems in	60

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			wind energy conversion systems rated up to 10 kW	
4	Edit	Elective	Correct title of UEENEEK134A - Install ELV stand-alone photovoltaic power systems	60
4	Edit	Elective	Correct title of UEENEEK135A - Design grid connected photovoltaic power supply systems	60
4	Edit	Elective	Correct title of UEENEEK137A - Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
4	Edit	Elective	Correct title of UEENEEK143A - Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
4	Edit	Elective	Correct title of UEENEEK144A - Install, configure and commission LV wind energy conversion systems rated up to 10 kW	40
4	Edit	Elective	Correct title of UEENEEK148A - Install, configure and commission LV grid connected photovoltaic power systems	40
4	Edit	Elective	Correct title of UEENEEK153A - Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
4	Edit	Elective	Correct title of UEENEEK154A - Assess energy loads and uses for energy efficiency in commercial facilities	40
4	Edit	Elective	Correct title of UEENEEK155A - Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

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Description

Scope

Select, install, set up, test, fault find, repair and maintain electrical systems and equipment in buildings and premises. It includes ERAC requirements for an 'Electrician's licence' and competencies to select, install, set up, test, fault find, repair and maintain stand alone renewable energy equipment and systems.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general	40

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	electrical installations	
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	80
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK127A	Diagnose and rectify faults in renewable energy control systems	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**1120**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	50
B	**Qualification Elective Units**	0	120
C	**Qualification Elective Units** You may select all your elective units from this Group	40	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 50		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	Up to 50 points

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	Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 120		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems	20
UEENEEK102A	Work safely with remote area power supply systems	20
UEENEEK124A	Solve basic problems in micro hydro systems	20
UEENEEK128A	Solve problems in stand-alone renewable energy systems	60
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW	60
UEENEEK134A	Install ELV stand-alone photovoltaic power systems	60
UEENEEK136A	Install, configure and commission LV micro-hydro systems rated up to 6.4 kW	20
UEENEEK137A	Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
UEENEEK143A	Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
UEENEEK144A	Install, configure and commission LV wind energy conversion systems rated up to 10 kW	40
UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40

Group C – Qualification Elective Units	**Weighting**

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You must complete units to a minimum weighting of 40 You may select all your elective units from this Group		**Points**
UEENEEG076A	Install and replace low voltage current transformer metering	20
UEENEEK110A	Co-ordinate maintenance of renewable energy (RE) apparatus and systems	20
UEENEEK135A	Design grid connected photovoltaic power supply systems	60
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations	20
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities	40
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE42011 Certificate IV in Electrical - Photovoltaic systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEK135A - Design grid connected photovoltaic power supply systems	60
4	Edit	Core	Correct title of UEENEEK148A - Install, configure and commission LV grid connected photovoltaic power systems	40
4	Edit	Elective	Correct title of UEENEEC004B - Prepare specifications for the supply of materials and equipment for electrotechnology projects	40

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4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEE192A - Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
4	Edit	Elective	Correct title of UEENEEG125A - Plan electrical installations with a low voltage demand up to 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG172A - Investigate and report on electrical incidents and causes	60
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEK128A - Solve problems in stand-alone renewable energy systems	60
4	Edit	Elective	Correct title of UEENEEK130A - Solve problems in wind energy conversion systems rated up to 10 kW	60
4	Edit	Elective	Correct title of UEENEEK134A - Install ELV stand-alone photovoltaic power systems	60
4	Edit	Elective	Correct title of UEENEEK137A - Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
4	Edit	Elective	Correct title of UEENEEK143A - Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
4	Edit	Elective	Correct title of UEENEEK144A - Install, configure and commission LV wind energy conversion systems rated up to 10 kW	40

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Description

Scope

Select, install, set up, test, fault find, repair and maintain electrical systems and equipment in buildings and premises. It includes ERAC requirements for an 'Electrician's licence' and competencies to select, install, set up, test, fault find, repair and maintain photovoltaic systems and associated equipment

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 180 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general	40

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	electrical installations	
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK135A	Design grid connected photovoltaic power supply systems	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40
Total points in core		**1100**

Elective Competency Standard Units

Complete Elective units to achieve a total of weighting of 180 points from the following groups:

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Group		Minimum points	Maximum points
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	90
B	**Qualification Elective Units**	0	90
C	**Qualification Elective Units** You may select all your elective units from this Group	90	180

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 90		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant	Up to 90 points

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	EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

Group B – Qualification Elective Units You may complete units to a maximum weighting of 90		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60
UEENEEG120A	Select and arrange equipment for special LV electrical installations	60
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	80
UEENEEK124A	Solve basic problems in micro hydro systems	20
UEENEEK127A	Diagnose and rectify faults in renewable energy control systems	60
UEENEEK128A	Solve problems in stand-alone renewable energy systems apparatus and systems	60
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW	60

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UEENEEK134A	Install ELV stand-alone photovoltaic power systems	60
UEENEEK136A	Install, configure and commission LV micro-hydro systems rated up to 6.4 kW	20
UEENEEK137A	Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
UEENEEK143A	Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
UEENEEK144A	Install, configure and commission LV wind energy conversion systems rated up to 10 kW	40

Group C – Qualification Elective Units You must complete units to a minimum weighting of 90 You may select all your elective units from this Group		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEG076A	Install and replace low voltage current transformer metering	20
UEENEEG121A	Verify compliance and functionality of special LV electrical installations	40
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40
UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40

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UEENEEG172A	Investigate and report on electrical incidents and causes	60
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE42111 Certificate IV in Electrotechnology - Electrical Contracting

Modification History

Release	Action	Core/Elective	Details	Points
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG113A - Install and maintain emergency safety systems	60
4	Edit	Elective	Correct title of UEENEEG120A - Select and arrange equipment for special LV electrical installations	60
4	Edit	Elective	Correct title of UEENEEG125A - Plan electrical installations with a low voltage demand up to 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG128A - Plan low voltage switchboard and control panel layouts	40
4	Edit	Elective	Correct title of UEENEEG132A - Carry out low voltage electrical field testing and report findings	60
4	Edit	Elective	Correct title of UEENEEG172A - Investigate and report on electrical incidents and causes	60

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4	Edit	Elective	Correct title of UEENEEG177A - Select low voltage power factor correction equipment	40
4	Edit	Elective	Correct title of UEENEEG185A - Select effective and efficient light sources and luminaries for given locations and designs	60

Description

Scope

This qualification provides competencies to set up and manage an electrical contracting business. It includes competencies required by regulations for an electrical contracting licence. It includes ERAC requirements for an 'Electrician's licence' and competencies to select, install, set up, test, fault find, repair and maintain photovoltaic systems and associated equipment.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 240 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general	40

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	electrical installations	
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**960**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 240 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	120

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 240 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	120
B	**Qualification Elective Units**	0	120
C	**Qualification Elective Units** You may select all your elective units from this Group	120	240

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 120		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use basic computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10

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	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 120 points

Group B – Qualification Elective Units You may complete units to a maximum weighting of 120		**Weighting Points**
UEENEEG113A	Install and maintain emergency safety systems	60
UEENEEG120A	Select and arrange equipment for special LV electrical installations	60
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEG189A	Install and maintain emergency lighting systems	40
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60

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Group C – Qualification Elective Units You must complete units to a minimum weighting of 120 You may select all your elective units from this Group		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEC009B	Provide quotations for inspection and compliance audit services	20
UEENEEG076A	Install and replace low voltage current transformer metering	20
UEENEEG121A	Verify compliance and functionality of special LV electrical installations	40
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40
UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40
UEENEEG172A	Investigate and report on electrical incidents and causes	60
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80
UEENEEG177A	Select low voltage power factor correction equipment	40

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UEENEEG179A	Develop detailed electrical drawings	60
UEENEEG184A	Provide photometric data for illumination system design	60
UEENEEG185A	Select effective and efficient light sources and luminaries for given locations and designs	60
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings	20
UEENEEG188A	Prepare quotations for the supply of effective and efficient lighting products for lighting projects	20
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE42211 Certificate IV in Instrumentation and Control

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Update	Group A	HLTCPR211A Perform CPR	10
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI106A Set up and adjust PID control loops	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI110A Set up and adjust advanced PID process control loops	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and	60

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			analogue control programs for programmable logic controllers.	
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI114A Trouble shoot process control systems	60

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE119A - Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
4	Edit	Core	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Core	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Core	Correct title of UEENEEI107A - Install instrumentation and control cabling and tubing	20
4	Edit	Core	Correct title of UEENEEI108A - Install instrumentation and control apparatus and associated equipment	20
4	Edit	Core	Correct title of UEENEEP013A - Disconnect - reconnect control devices connected to low voltage installation wiring	60
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic	40

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			electronic apparatus faults by replacement of components	
4	Edit	Elective	Correct title of UEENEEI117A - Calibrate, adjust and test measuring instruments	40
4	Edit	Elective	Correct title of UEENEEI121A - Trouble shoot in measuring and analysis systems	40
4	Edit	Elective	Correct title of UEENEEI122A - Assist in commissioning process and instrumentation control systems	40
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60

Description

Scope
This qualification provides competencies to select, install, set up, test, fault find, repair, maintain and commission systems and devices for measurement and recording of physical/chemical phenomenon and related process control systems.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 200 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEI112A - Those holding an ‘Certificate III in Instrumentation and Control trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40

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UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI106A	Set up and adjust PID control loops	40
UEENEEI107A	Install instrumentation and control cabling and tubing	20
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI110A	Set up and adjust advanced PID process control loops	40
UEENEEI111A	Find and rectify faults in process final control elements	40
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations	40
UEENEEI113A	Setup and configure human-machine interface (HMI) and industrial networks	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEP013A	Disconnect - reconnect control devices connected to low voltage installation wiring	60
Total points in core		**1080**

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 200 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units** You may select all your elective units from this Group	100	200

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10

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	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEI114A	Trouble shoot process control systems	60
UEENEEI117A	Calibrate, adjust and test measuring instruments	40
UEENEEI118A	Set up weighting measuring and control instruments	20
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60

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UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 100 You may select all your elective units from this Group		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEI121A	Trouble shoot in measuring and analysis systems	40
UEENEEI122A	Assist in commissioning process and instrumentation control systems	40
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40

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UEENEEM078A	Manage compliance of hazardous areas	20
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40
UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM043A	Conduct detailed inspection of hazardous areas installations — coal mining	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	40
UEENEEM045A	Conduct detailed inspection of hazardous areas installations — dust atmospheres	40
UEENEEM046A	Conduct detailed inspection of hazardous areas installations — pressurisation	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE42611 Certificate IV in Hazardous areas - Electrical

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10

3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEM080A - Report on the integrity of explosion-protected equipment in a hazardous area	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20

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Description

Scope

This qualification provides competencies to supervise selection, installation, commissioning maintenance and testing of explosion-protected equipment and systems for control and monitoring of plant and processes. The qualification provides competencies in working with explosion protections techniques with elections in how they apply to coal mining, gas and dust atmospheres. It includes ERAC requirements for an 'Electrician's licence' and competencies to select, install, set up, test, fault find, repair and maintain stand alone renewable energy equipment and systems.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 300 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general	40

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	electrical installations	
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
Total points in core		**980**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 300 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units**	0	80
C	**Qualification Elective Units** You may select all your elective units from this Group	220	300

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	Up to 60 points

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	Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM031A	Overhaul and repair of explosion-protected equipment — coal mining	60
UEENEEM032A	Overhaul and repair of explosion-protected equipment — flameproof enclosures	60
UEENEEM033A	Overhaul and repair of explosion-protected equipment — gas atmospheres	60

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UEENEEM034A	Overhaul and repair of explosion-protected equipment — dust atmospheres	40
UEENEEM060A	Carry out overhaul and repair of explosion-protected equipment — coal mining	60
UEENEEM061A	Carry out overhaul and repair of explosion-protected equipment — flameproof enclosures	60
UEENEEM062A	Carry out overhaul and repair of explosion-protected equipment — gas atmospheres	60
UEENEEM063A	Carry out overhaul and repair of explosion-protected equipment — dust atmospheres	60
UEENEEM070A	Repair reeling, trailing and flexible cables	60
UEENEEM071A	Test reeling, trailing and flexible cables	60
UEENEEM072A	Inspect and fit plugs/couplers for reeling, trailing and flexible cables	60
UEENEEM073A	Verify compliance of repaired reeling, trailing and flexible cables	60
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 220 You may select all your elective units from this Group		**Weighting Points**
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40

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UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM043A	Conduct detailed inspection of hazardous areas installations — coal mining	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	40
UEENEEM045A	Conduct detailed inspection of hazardous areas installations — dust atmospheres	40
UEENEEM046A	Conduct detailed inspection of hazardous areas installations — pressurisation	40
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	20
UEENEEM048A	Develop and manage maintenance programs for hazardous areas electrical equipment — gas atmospheres	20
UEENEEM049A	Develop and manage maintenance programs for hazardous areas electrical equipment — dust atmospheres	20
UEENEEM050A	Develop and manage maintenance programs for hazardous areas electrical equipment — pressurisation	20
UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	20
UEENEEM055A	Plan electrical installations for hazardous areas — dust atmospheres	20
UEENEEM056A	Plan electrical installations for hazardous areas — pressurisation	20
UEENEEM074A	Plan electrical installations in hazardous areas — coal mining	20
UEENEEM078A	Manage compliance of hazardous areas	20

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Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE42711 Certificate IV in Air-conditioning and Refrigeration Servicing

Modification History

Release	Action	Core/Elective	Details	Points
3	Update	Group A	HLTCPR211A Perform CPR	10
4	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
5	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
5	Edit	Core	Correct title of UEENEEJ110A - Select refrigerant piping, accessories and associated controls	50
5	Edit	Core	Correct title of UEENEEJ153A - Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
5	Edit	Core	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20
5	Edit	Elective	Correct title of UEENEEJ178A - Apply safety awareness and legal requirements for ammonia refrigerant	10

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Description

Scope
This qualification provides competencies in high level fault diagnosis and rectification, commissioning and maintenance of refrigeration systems and equipment that apply to commercial food storage and preservation, air-conditioning, air distribution equipment and/or special applications. It includes regulatory requirements for purchasing and handling refrigerants.

Note:
The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 180 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEJ109A - Those holding an ‘Certificate III in Refrigeration and Air-conditioning trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air	20

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	conditioning systems	
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment	80
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations	20
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components	40
UEENEEJ112A	Diagnose and rectify faults in complex air conditioning/ refrigeration systems	100
UEENEEJ113A	Commission air conditioning and refrigeration systems	40
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	60
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

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Total points in core	**1100**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 180 points from the following groups:			
Groups		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	90
B	**Qualification Elective Units**	0	90
C	**Qualification Elective Units** You may select all your elective units from this Group	90	180

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 90		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20

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CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 90 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 90		**Weighting Points**
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ114A	Resolve problems in hydronic systems	40
UEENEEJ115A	Resolve problems in beverage dispensers	40
UEENEEJ116A	Resolve problems in transport refrigeration systems	20
UEENEEJ117A	Resolve problems in ultra-low temperature refrigeration systems	20
UEENEEJ118A	Resolve problems in post mix refrigeration systems	20
UEENEEJ119A	Resolve problems in ice making systems	20
UEENEEJ120A	Resolve problems in industrial refrigeration systems	20
UEENEEJ167A	Resolve problems in central plant air conditioning systems	40
UEENEEJ168A	Maintain microbial control of refrigeration and air conditioning systems	20
UEENEEJ171A	Resolve problems in refrigerated beverage vending cabinets	20
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10
UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	20
UEENEEJ176A	Install and commission hydrocarbon refrigeration systems, components and associated equipment	20
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant	10
UEENEEJ179A	Repair and service ammonia refrigeration systems	20
UEENEEJ180A	Install and commission ammonia refrigeration	20

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	systems, components and associated equipment	
UEENEEJ182A	Repair and service secondary refrigeration systems	20
UEENEEJ184A	Apply safety awareness and legal requirements for carbon dioxide refrigerant	10
UEENEEJ185A	Repair and service carbon dioxide refrigeration systems	20
UEENEEJ186A	Install and commission carbon dioxide refrigeration systems, components and associated equipment	20
UEENEEJ188A	Repair and service self contained carbon dioxide refrigeration and heat pump systems	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 90 You may select all your elective units from this Group		**Weighting Points**
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEJ121A	Monitor and adjust refrigeration energy management systems	40
UEENEEJ122A	Diagnose faults in complex HVAC /refrigeration control systems	80
UEENEEJ123A	Commission complex (HVAC) heating, ventilation and air conditioning systems	80
UEENEEJ124A	Commission refrigeration/air conditioning hydronic systems	80
UEENEEJ125A	Commission complex refrigeration systems and equipment	80
UEENEEJ126A	Commission complex refrigeration/air conditioning control systems	40

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Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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UEE42811 Certificate IV in Air-conditioning Systems Energy Management and Control

Modification History

Release	Action	Core/Elective	Details	Points
3	Update	Group A	HLTCPR211A Perform CPR	10
4	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
5	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
5	Edit	Core	Correct title of UEENEEJ110A - Select refrigerant piping, accessories and associated controls	50
5	Edit	Core	Correct title of UEENEEJ153A - Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
5	Edit	Core	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20
5	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20

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Description

Scope

This qualification provides competencies to develop strategies for the reduction of energy in buildings and to recommend changes in the way in which energy is controlled in the building either by the installation of new control equipment or by the modification or re-programming of that existing. It includes regulatory requirements for purchasing and handling refrigerants.

Note:

The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 160 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEJ109A - Those holding an 'Certificate III in Refrigeration and Air-conditioning trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air	20

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	conditioning systems	
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment	80
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations	20
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components	40
UEENEEJ113A	Commission air conditioning and refrigeration systems	40
UEENEEJ136A	Evaluate and report on building services energy management systems	80
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	60
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500	20

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	Vd.c. supply	
Total points in core		**1120**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 160 points from the following groups:			
Groups		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	80
B	**Qualification Elective Units**	0	80
C	**Qualification Elective Units** You may select all your elective units from this Group	80	160

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20

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CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 80 points

Group B – Qualification Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ167A	Resolve problems in central plant air conditioning systems	40

Group C – Qualification Elective Units You must complete units to a minimum weighting of 80 You may select all your elective units from this Group		**Weighting Points**
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEJ121A	Monitor and adjust refrigeration energy management	40

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	systems	
UEENEEJ122A	Diagnose faults in complex HVAC /refrigeration control systems	80
UEENEEJ123A	Commission complex (HVAC) heating, ventilation and air conditioning systems	80
UEENEEJ124A	Commission refrigeration/air conditioning hydronic systems	80
UEENEEJ125A	Commission complex refrigeration systems and equipment	80
UEENEEJ126A	Commission complex refrigeration/air conditioning control systems	40

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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UEE42911 Certificate IV in Refrigeration and Air-conditioning Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	Group A	HLTCPR211A Perform CPR	10
5	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
5	Edit	Core	Correct title of UEENEEJ110A - Select refrigerant piping, accessories and associated controls	50
5	Edit	Core	Correct title of UEENEEJ153A - Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
5	Edit	Core	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20
5	Edit	Elective	Correct title of UEENEEJ191A - Select residential air conditioning system equipment, components and accessories	40

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Description

Scope

This qualification provides the competencies to determine heat loads and select equipment for basic commercial refrigeration or residential air conditioning applications. It includes regulatory requirements for purchasing and handling refrigerants.

Note:

1. Basic commercial refrigeration includes commercial coldrooms, freezer rooms and cabinets with single a compressor or condensing unit. This does not include large, complex commercial applications or industrial applications.
2. Residential air conditioning applications are those covered under the Building Code of Australia's – Class 1A Residential Buildings.
3. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 50 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEJ109A - Those holding an ‘Certificate III in Refrigeration and Air-conditioning trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ106A	Install refrigerant pipe work, flow controls and	60

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	accessories	
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment	80
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations	20
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components	40
UEENEEJ113A	Commission air conditioning and refrigeration systems	40
UEENEEJ127A	Establish the thermodynamic parameters of refrigeration and air conditioning systems	80
UEENEEJ129A	Establish heat loads for commercial refrigeration and/or air conditioning applications.	80
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70
UEENEEJ192A	Analyse the psychrometric performance of HVAC/R systems	50
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	60
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	20
UEENEEP024A	Attach cords and plugs to electrical equipment for	20

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	connection to a single phase 230 Volt supply	
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20
Total points in core		**1230**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 50 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	20
B	**Qualification Elective Units**	0	30
C	**Qualification Elective Units** You may select all your elective units from this Group	20	50

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE020B	Provide basic instruction in the use of	20

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	electrotechnology apparatus	
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 20 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 30		**Weighting Points**
UEENEEJ114A	Resolve problems in hydronic systems	40
UEENEEJ115A	Resolve problems in beverage dispensers	40
UEENEEJ116A	Resolve problems in transport refrigeration systems	20
UEENEEJ117A	Resolve problems in ultra-low temperature refrigeration systems	20
UEENEEJ118A	Resolve problems in post mix refrigeration systems	20
UEENEEJ119A	Resolve problems in ice making systems	20
UEENEEJ120A	Resolve problems in industrial refrigeration systems	20
UEENEEJ167A	Resolve problems in central plant air conditioning systems	40
UEENEEJ168A	Maintain microbial control of refrigeration and air conditioning systems	20
UEENEEJ171A	Resolve problems in refrigerated beverage vending cabinets	20
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10
UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	20
UEENEEJ176A	Install and commission hydrocarbon refrigeration systems, components and associated equipment	20
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant	10
UEENEEJ179A	Repair and service ammonia refrigeration systems	20
UEENEEJ180A	Install and commission ammonia refrigeration systems, components and associated equipment	20

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UEENEEJ182A	Repair and service secondary refrigeration systems	20
UEENEEJ184A	Apply safety awareness and legal requirements for carbon dioxide refrigerant	10
UEENEEJ185A	Repair and service carbon dioxide refrigeration systems	20
UEENEEJ186A	Install and commission carbon dioxide refrigeration systems, components and associated equipment	20
UEENEEJ188A	Repair and service self contained carbon dioxide refrigeration and heat pump systems	20

Group C – Qualification Elective Units You must complete units to a minimum weighting of 20 You may select all your elective units from this Group		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEJ190A	Select basic commercial refrigeration system equipment, components and accessories	40
UEENEEJ191A	Select residential air conditioning system equipment, components and accessories	40

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

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UEE43011 Certificate IV in Electrical Equipment and Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UETTDRIS67A Solve problems in energy supply network equipment	80
2	Add	Group B	UETTDRIS68A Solve problems in energy supply network protection equipment and systems	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	60
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20

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3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	60

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEG199A - Conduct compliance and functional verification of electrical apparatus and existing circuits	40
4	Edit	Elective	Correct title of UEENEEA110A - Assemble, mount and connect control gear and switchgear	40
4	Edit	Elective	Correct title of UEENEEA112A - Fabricate and assemble bus bars	60
4	Edit	Elective	Correct title of UEENEEA113A - Mount and wire control panel equipment	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG110A - Find and repair faults in LV d.c. electrical apparatus and circuits	60
4	Edit	Elective	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of UEENEEG116A - Diagnose and rectify faults in traction lift systems	80
4	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG128A - Plan low voltage switchboard and control panel layouts	40
4	Edit	Elective	Correct title of UEENEEG129A - Overhaul and repair major switchgear and controlgear	60

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4	Edit	Elective	Correct title of UEENEEG153A - Rewind three phase low voltage induction machines	60
4	Edit	Elective	Correct title of UEENEEG155A - Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
4	Edit	Elective	Correct title of UEENEEG156A - Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
4	Edit	Elective	Correct title of UEENEEG159A - Conduct mechanical tests on electrical machines and components	40
4	Edit	Elective	Correct title of UEENEEG164A - Repair and maintain mechanical components of electrical machines	40
4	Edit	Elective	Correct title of UEENEEG165A - Maintain and service traction lifts systems and equipment	40
4	Edit	Elective	Correct title of UEENEEG166A - Install and maintain escalators, moving walks and treadways	40
4	Edit	Elective	Correct title of UEENEEG167A - Align and install traction lift equipment	20
4	Edit	Elective	Correct title of UEENEEG168A - Diagnose and rectify faults in complex lift systems	40
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI107A - Install instrumentation and control cabling and tubing	20
4	Edit	Elective	Correct title of UEENEEI108A - Install instrumentation and control apparatus and associated equipment	20

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4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI119A - Set up industrial field control devices	60
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEJ153A - Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
4	Edit	Elective	Correct title of UETTDRIS44A - Perform HV field switching operation to a given schedule	40

Description

Scope

This qualification provides competencies to manufacture, fit, assemble, erect, operate, test, fault find, alter, repair electrical equipment and includes electrical wiring work only if that work is associated with assembling, maintaining, terminating or altering the wiring between electrical components within a plant or machinery. An electrical fitter is not authorised to install any electrical wiring systems within an electrical installation as prescribed by definitions contained in AS/NZS 3000.

Electrical equipment means any appliance, article, accessory, wire, fitting, cable, conduit or apparatus that generates, uses, conveys or controls (or that is intended to generate, use, convey or control) electricity above extra low voltage.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

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Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 420 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG199A - Those holding an 'Electrical Fitter Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60

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UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG199A	Conduct compliance and functional verification of electrical apparatus and existing circuits	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**860**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 420 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units**	0	200
C	**Qualification Elective Units** You may select all your elective units from this Group	220	420

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Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 200		**Weighting Points**
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40
UEENEEA112A	Fabricate and assemble bus bars	60
UEENEEA113A	Mount and wire control panel equipment	40
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF115A	Assemble and connect telecommunication frames and cabinets	60
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEG150A	Wind electrical coils	40
UEENEEG151A	Place and connect electrical coils	40
UEENEEG152A	Rewind single phase machines	40
UEENEEG153A	Rewind three phase low voltage induction machines	60
UEENEEG154A	Rewind LV direct current machines	60

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UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEG165A	Maintain and service traction lifts systems and equipment	40
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40
UEENEEG167A	Align and install traction lift equipment	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI107A	Install instrumentation and control cabling and tubing	20
UEENEEI108A	Install instrumentation and control apparatus and	20

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	associated equipment	
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ105A	Position, assemble and start up single head split air conditioning and water heating heat pump systems	70
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60
UEENEEJ151A	Service small electrical appliances and power tools	60
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ154A	Find and rectify faults in appliance control systems and devices	60
UEENEEJ155A	Service refrigeration appliances	60
UEENEEJ156A	Service clothes washing machines and dryers	40
UEENEEJ157A	Service electrical heating appliances	60
UEENEEJ158A	Service dishwasher machines	40
UEENEEJ159A	Service gas heating appliances	40
UEENEEJ162A	Recover, pressure test, evacuate, charge and leak test refrigerants - appliances	50
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70

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UEENEEJ173A	Service and repair microwave ovens	40
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40
UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances	50
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM031A	Overhaul and repair of explosion-protected equipment — coal mining	60
UEENEEM032A	Overhaul and repair of explosion-protected equipment — flameproof enclosures	60
UEENEEM033A	Overhaul and repair of explosion-protected equipment — gas atmospheres	60
UEENEEM034A	Overhaul and repair of explosion-protected equipment — dust atmospheres	40
UEENEEM060A	Carry out overhaul and repair of explosion-protected equipment — coal mining	60
UEENEEM061A	Carry out overhaul and repair of explosion-protected equipment — flameproof enclosures	60

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UEENEEM062A	Carry out overhaul and repair of explosion-protected equipment — gas atmospheres	60
UEENEEM063A	Carry out overhaul and repair of explosion-protected equipment — dust atmospheres	60
UEENEEM070A	Repair reeling, trailing and flexible cables	60
UEENEEM071A	Test reeling, trailing and flexible cables	60
UEENEEM072A	Inspect and fit plugs/couplers for reeling, trailing and flexible cables	60
UEENEEM073A	Verify compliance of repaired reeling, trailing and flexible cables	60
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
UEENEEN102A	Assemble and wire internal electrical rail signalling equipment	30
UETTDRIS43A	Perform low voltage field switching operation to a given schedule.	50
UETTDRIS44A	Perform HV field switching operation to a given schedule	40
UETTDRIS47A	Sample, test, filter and reinstate insulating oil	40
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40
UETTDRSB29A	Maintain capacitor bank equipment for voltage regulation	40
UETTDRSB39A	Perform power system substation switching operation to a given schedule	50

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Group C – Qualification Elective Units You must complete units to a minimum weighting of 220 You may select all your elective units from this Group		**Weighting Points**
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
UEENEEG156A	Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
UEENEEG158A	Conduct electrical tests on HV electrical machines	60
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external	40

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	devices	
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40
UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM043A	Conduct detailed inspection of hazardous areas installations — coal mining	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	40
UEENEEM045A	Conduct detailed inspection of hazardous areas installations — dust atmospheres	40
UEENEEM046A	Conduct detailed inspection of hazardous areas installations — pressurisation	40
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	20
UEENEEM048A	Develop and manage maintenance programs for hazardous areas electrical equipment — gas atmospheres	20
UEENEEM049A	Develop and manage maintenance programs for hazardous areas electrical equipment — dust atmospheres	20
UEENEEM050A	Develop and manage maintenance programs for hazardous areas electrical equipment — pressurisation	20
UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	20
UEENEEM055A	Plan electrical installations for hazardous areas — dust atmospheres	20

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UEENEEM056A	Plan electrical installations for hazardous areas — pressurisation	20
UEENEEM074A	Plan electrical installations in hazardous areas - Coal mining	20
UEENEEM078A	Manage compliance of hazardous areas	20

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE43111 Certificate IV in Energy Efficiency and Assessment

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEED104A - Use engineering applications software on personal computers	40
4	Edit	Elective	Correct title of UEENEEG185A - Select effective and efficient light sources and luminaries for given locations and designs	60
4	Edit	Elective	Correct title of UEENEEG186A - Design effective and efficient lighting for residential and commercial buildings	20
4	Edit	Elective	Correct title of UEENEEK155A - Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

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Description

Scope

This qualification provides competencies to conduct a residential, office and retail dwellings residential and Small Medium Enterprises (SME) energy audit and to develop energy efficient strategies to reduce an energy use in a range of energy services. The qualification also addresses the environmental and legislative contexts with the fundamental energy audit methodology to develop the initiative and solutions of sustainability and financial viability. The core competencies of this qualification meets the prescribed requirements for ERAC requirements for an 'Electrician's licence'.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 260 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical	40

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	installations	
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations	20
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
Total points in core		**1020**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 260 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must	0	120

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	be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.		
B	**Qualification Elective Units**	0	120
C	**Qualification Elective Units**	140	260

Group A – Imported and Common Electives Units. You may complete units to a maximum weighting of 120		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE006B	Apply methods to maintain currency of industry developments	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 120 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 120		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20

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Group C – Qualification Elective Units. You must complete units to a minimum weighting of 140 You may select all your elective units from this Group		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEG076A	Install and replace low voltage current transformer metering	20
UEENEEG184A	Provide photometric data for illumination system design	60
UEENEEG185A	Select effective and efficient light sources and luminaries for given locations and designs	60
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings	20
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen	20
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20
UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20
UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities	40
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE43211 Certificate IV in Industrial Automation and Control

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Update	Group A	HLTCPR211A Perform CPR	10
	Update	Group A	Edit Unit Code to reflect correct Unit Code TLILIC2001 Licence to operate a forklift truck	40

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3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI106A Set up and adjust PID control loops	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI110A Set up and adjust advanced PID process control loops	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE119A - Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40

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4	Edit	Core	Correct title of UEENEEI138A - Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	60
4	Edit	Core	Correct title of UEPOPS416B - Monitor the implementation of the enterprise's production-maintenance quality control procedures	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80
4	Edit	Elective	Correct title of UEENEED117A - Install and configure network systems for internetworking	120
4	Edit	Elective	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of UEENEEG164A - Repair and maintain mechanical components of electrical machines	60
4	Edit	Elective	Correct title of UEENEEH111A - Troubleshoot single phase input d.c. power supplies	40
4	Edit	Elective	Correct title of UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	80
4	Edit	Elective	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI107A - Install instrumentation and control cabling and tubing	20
4	Edit	Elective	Correct title of UEENEEI108A - Install instrumentation and control apparatus and associated equipment	20
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI121A - Trouble shoot in	40

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			measuring and analysis systems	
4	Edit	Elective	Correct title of UEENEEI122A - Assist in commissioning process and instrumentation control systems	40
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEP026A - Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Description

Scope

This qualification provides competencies to assemble, set up and program, fault find, repair and maintain automated equipment, apparatus, associated circuits and systems. It's includes the supervision of plant maintenance programs and providing technical advice to process staff.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 760 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEI138A	Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEPOPS202B	Apply Quality Systems To Work	20
UEPOPS337B	Maintain Quality Systems within the Team	20
UEPOPS416B	Monitor the implementation of the enterprise's production-maintenance quality control procedures	20
Total points in core		**520**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 760 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 4. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	220
B	**Qualification Elective Units**	0	540
C	**Qualification Elective Units** You may select all your elective units from this Group	220	760

Group A – Imported and Common Elective Units. You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20

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UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
BSBINN301A	Promote Innovation in a team Environment	40
BSBCUS401B	Coordinate implementation of customer service strategies	40
BSBINM401A	Implement workplace information system	40
BSBLED401A	Develop teams and individuals	40
BSBMGT402A	Implement operational plan	40
BSBMGT403A	Implement continuous improvement	40
BSBWOR401A	Establish effective workplace relationships	50
BSBWOR402A	Promote team effectiveness	50
BSBWOR404B	Develop Work Priorities	40
TLILIC2001A	Licence to operate a forklift truck	40
HLTAID001	Provide cardiopulmonary resuscitation	10

Group B – Qualification Elective Units. You may complete units to a maximum weighting of 540		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED146A	Set up and configure basic local area network (LAN)	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80

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UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	60
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI106A	Set up and adjust PID control loops	40
UEENEEI107A	Install instrumentation and control cabling and tubing	20
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI110A	Set up and adjust advanced PID process control loops	40
UEENEEI111A	Find and rectify faults in process final control elements	40
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations	40
UEENEEI113A	Setup and configure human-machine interface (HMI) and industrial networks	60
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEM080A	Report on the integrity of explosion-protected equipment in a	20

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	hazardous area	
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20
UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Group C – Qualification Elective Units. You must complete units to a minimum weighting of 220 You may select all your elective units from this Group		**Weighting Points**
UEENEED117A	Install and configure network systems for internetworking	120
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI121A	Trouble shoot in measuring and analysis systems	40
UEENEEI122A	Assist in commissioning process and instrumentation control systems	40
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40

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Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE50111 Diploma of Computer Systems Engineering

Modification History

Release	Action	Core/Elective	Details	Points
	Add	Group B	UEENEEI101A Use instrumentation drawings, specification, standards and equipment manuals	40
	Add	Group D	UEENEED147A Develop energy sector directory services	80
	Add	Group D	UEENEEH157A Develop basic plans for integrating security systems	40
	Add	Group C	UEENEED116A Develop computer network services	120
	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	

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3	Add	Group A	ICTTEN4210A Implement and troubleshoot enterprise routers and switches	100
3	Add	Group A	ICTTEN4211A Design, install and configure an internetwork	100
3	Add	Group A	ICTTEN4212A Apply advanced routing protocols to network design	80
3	Add	Group A	ICTTEN4213A Configure and troubleshoot advanced network switching	80
3	Add	Group A	ICTTEN4214A Install and maintain a wide area network	80

4	Edit	Core	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Edit	Elective	Correct title of UEENEEE020B Provide basic instruction in the use of electrotechnology apparatus	20
4	Edit	Elective	Correct title of UEENEEE125A Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Elective	Correct title of UEENEEH183A Analyse the performance of wireless-based electronic - communication systems	40

Description

Scope

This qualification provides competencies to develop, select, install, commission and maintain computer equipment and systems.

Pathways Information

Not applicable.

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Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 1460 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED144A	Commission industrial computer systems	20
UEENEED145A	Modify-redesign of industrial computer systems	20
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**140**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 1460 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is	0	270

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	first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.		
B	**Qualification Elective Units**	0	880
C	**Qualification Elective Units**	0	580
D	**Qualification Elective Units**	580	1040

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 270		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
ICTTEN4210A	Implement and troubleshoot enterprise routers and switches	100
ICTTEN4211A	Design, install and configure an internetwork	100
ICTTEN4212A	Apply advanced routing protocols to network design	80

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ICTTEN4213A	Configure and troubleshoot advanced network switching	80
ICTTEN4214A	Install and maintain a wide area network	80
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 270 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 880		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA106A	Use lead-free soldering techniques	40
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE123A	Solve basic problems electronic and digital equipment	80

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	and circuits	
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH150A	Assemble and set up basic security systems	80

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UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 580		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED103A	Evaluate and modify object oriented code programs	40
UEENEED110A	Set up, create and implement content for a web server	120
UEENEED113A	Install and administer Unix based networked computers	80
UEENEED116A	Develop computer network services	120
UEENEED117A	Install and configure network systems for internetworking	120
UEENEED124A	Integrate multiple computer operating systems on a client server local area network	80
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEE114A	Supervise and coordinate energy sector work activities	40

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UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEI157A	Configure and maintain industrial control system networks	60

Group D – Qualification Elective Units You must complete units to a minimum weighting of 580 to a maximum of 1040		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEED111A	Develop, implement and test object oriented code	140
UEENEED115A	Administer computer networks	80
UEENEED118A	Design and implement network systems for internetworking	120
UEENEED147A	Develop energy sector directory services	80
UEENEED150A	Develop industrial control programs for microcomputer equipped devices	60
UEENEED151A	Provide programming solution for computer systems engineering problems	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE070B	Write specifications for computer systems engineering projects	40
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEH145A	Develop engineering solutions to analogue electronic problems	80

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UEENEEH148A	Design and develop advanced digital systems	40
UEENEEH157A	Develop basic plans for integrating security systems	40
UEENEEH181A	Design electronic printed circuit boards	40
UEENEEH183A	Analyse the performance of wireless-based electronic - communication systems	40
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI156A	Develop and test code for microcontroller devices	60

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.

END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE50211 Diploma of Electrical and Instrumentation

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI106A Set up and adjust PID control loops	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI110A Set up and adjust advanced PID process control loops	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60

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4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE124A - Compile and produce an energy sector detailed report	60
4	Edit	Core	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Core	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Core	Correct title of UEENEEI107A - Install instrumentation and control cabling and tubing	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60

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Description

Scope

This qualification provides competencies to develop, select, install, commission, maintain and diagnose faults/malfunctions on electrical, instrumentation and control equipment and systems. It includes ERAC requirements for an 'Electrician's licence'.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 80 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.
Note: UEENEEI112A - Those holding a 'Certificate III in Instrumentation and Control trade qualification or equivalent' meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE084A	Write specifications for electrotechnology engineering projects	40
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20

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UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI106A	Set up and adjust PID control loops	40

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UEENEEI107A	Install instrumentation and control cabling and tubing	20
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI110A	Set up and adjust advanced PID process control loops	40
UEENEEI111A	Find and rectify faults in process final control elements	40
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations	40
UEENEEI113A	Setup and configure human-machine interface (HMI) and industrial networks	60
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1520**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 80 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	20
B	**Qualification Elective Units**	0	20
C	**Qualification Elective Units**	0	20

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 80 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	20
D	**Qualification Elective Units** You may select all your elective units from this Group	60	80

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative	20

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	maintenance program processes	
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 20 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60

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UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen	20
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20
UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40

Group D – Qualification Elective Units You must complete units to a minimum weighting of 40 You may select all your elective units from this Group		**Weighting Points**
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEI127A	Analyse complex electronic circuits controlling fluids	80
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60

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UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE50311 Diploma of Electrical and Refrigeration and Air-conditioning

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Included Group B and C to Elective Competency Standard Units table.	
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE124A - Compile and produce an energy sector detailed report	60
4	Edit	Core	Correct title of UEENEEJ102A - Prepare and connect refrigerant tubing and fittings	30
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG131A - Evaluate performance of low voltage electrical apparatus	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEJ178A - Apply safety awareness and legal requirements for ammonia refrigerant	10

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Description

Scope

This qualification provides competencies to select, install, commission, maintain and diagnose faults/malfunctions on refrigeration systems and equipment that apply to commercial food storage and preservation and air conditioning and air distribution equipment and special applications and associated electrical systems. It includes ERAC requirements for an 'Electrician's licence' and regulatory requirements for purchasing and handling refrigerants.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 80 points in accordance with the Elective Competency Standard Units table below.

Note: 1 UEENEEG105A - Those holding an ‘Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.
Note: 2. UEENEEJ109A - Those holding an ‘Certificate III in Refrigeration and Air-conditioning trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE084A	Write specifications for electrotechnology engineering projects	40
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20

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UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment	80
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60

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UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations	20
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components	40
UEENEEJ113A	Commission air conditioning and refrigeration systems	40
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1620**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 60 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	20
B	**Qualification Elective Units**	0	20
C	**Qualification Elective Units**	0	20

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 60 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	20
D	**Qualification Elective Units** You may select all your elective units from this Group	40	60

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee,	Up to 20 points

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	their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20
UEENEEJ118A	Resolve problems in post mix refrigeration systems	20
UEENEEJ119A	Resolve problems in ice making systems	20
UEENEEJ168A	Maintain microbial control of refrigeration and air conditioning systems	20
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant	10

Group C – Qualification Elective Units You may complete units to a maximum weighting of 20		**Weighting Points**
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen	20
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20
UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20
UEENEEG076A	Install and replace low voltage current transformer metering	20

Group D – Qualification Elective Units You must complete units to a minimum weighting of 40	**Weighting Points**

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You may select all your elective units from this Group		
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEJ137A	Evaluate and report on the indoor air quality of buildings	40

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE50411 Diploma of Electrical Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UETTDRIS67A Solve problems in energy supply network equipment	80
2	Add	Group B	UETTDRIS68A Solve problems in energy supply network protection equipment and systems	40
2	Add	Group B	UETTDRIS44A Perform HV field switching operation to a given schedule	60
2	Add	Group D	UETTDRIS69A Diagnose and rectify faults in energy supply apparatus	60
2	Add	Group D	UETTDRIS70A Diagnose and rectify faults in electrical energy distribution systems	60
2	Add	Group D	UETTDRIS71A Diagnose and rectify faults in electrical energy supply transmission systems	60
2	Add	Group D	UETTDRIS72A Diagnose and rectify faults in distributed Generation systems	60
3	Add	Group A	UEENEEE125A Provide engineering solutions for problems in complex multiple path circuit	60
3	Add	Group A	UEENEEE126A Provide solutions to basic engineering computational problems	60
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Edit		Edit Name to reflect correct Unit title UEENEEE117A Implement and monitor energy sector OHS policies and procedures	

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2	Edit		Edit Name to reflect correct Unit title UEENEEE124A Compile and produce an energy sector detailed report	
2	Edit		Edit Name to reflect correct Unit title UEENEEK132A Develop strategies to address environmental and sustainability issues in the energy sector	

3	Add	Group D	UEENEEE125A Provide engineering solutions for problems in complex multiple path circuit	60
3	Add	Group D	UEENEEE126A Provide solutions to basic engineering computational problems	60
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60

4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40

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4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEE121A Plan an integrated cabling installation system	40
4	Edit	Elective	Correct title of UEENEEE125A Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Elective	Correct title of UEENEEG110A Find and repair faults in LV d.c. electrical apparatus and circuits	60
4	Edit	Elective	Correct title of UEENEEG111A Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of UEENEEG113A Install and maintain emergency safety systems	60
4	Edit	Elective	Correct title of UEENEEG116A Diagnose and rectify faults in traction lift systems	80
4	Edit	Elective	Correct title of UEENEEG119A Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG120A Select and arrange equipment for special LV electrical installations	60
4	Edit	Elective	Correct title of UEENEEG125A Plan electrical installations with a low voltage demand up to 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG126A Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40
4	Edit	Elective	Correct title of UEENEEG127A Design electrical installations with a low voltage demand greater than 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG128A Plan low voltage switchboard and control panel layouts	40
4	Edit	Elective	Correct title of UEENEEG129A Overhaul and repair major switchgear and controlgear	60
4	Edit	Elective	Correct title of UEENEEG131A Evaluate performance of low voltage electrical apparatus	40

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4	Edit	Elective	Correct title of UEENEEG132A Carry out low voltage electrical field testing and report findings	60
4	Edit	Elective	Correct title of UEENEEG153A Rewind three phase low voltage induction machines	60
4	Edit	Elective	Correct title of UEENEEG155A Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
4	Edit	Elective	Correct title of UEENEEG156A Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
4	Edit	Elective	Correct title of UEENEEG159A Conduct mechanical tests on electrical machines and components	40
4	Edit	Elective	Correct title of UEENEEG164A Repair and maintain mechanical components of electrical machines	40
4	Edit	Elective	Correct title of UEENEEG165A Maintain and service traction lifts systems and equipment	40
4	Edit	Elective	Correct title of UEENEEG166A Install and maintain escalators, moving walks and treadways	40
4	Edit	Elective	Correct title of UEENEEG167A Align and install traction lift equipment	20
4	Edit	Elective	Correct title of UEENEEG168A Diagnose and rectify faults in complex lift systems	40
4	Edit	Elective	Correct title of UEENEEG172A Investigate and report on electrical incidents and causes	60
4	Edit	Elective	Correct title of UEENEEG177A Select low voltage power factor correction equipment	40
4	Edit	Elective	Correct title of UEENEEG185A Select effective and efficient light sources and luminaries for given locations and designs	60
4	Edit	Elective	Correct title of UEENEEH102A Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEH150A Assemble and	80

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			set up basic security systems	
4	Edit	Elective	Correct title of UEENEEI101A Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI103A Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI116A Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI119A Set up industrial field control devices	60
4	Edit	Elective	Correct title of UEENEEI126A Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI148A Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A Solve problems in polyphase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEK135A Design grid connected photovoltaic power supply systems	60
4	Edit	Elective	Correct title of UEENEEK138A Design micro-hydro systems rated to 6.4 kW	60
4	Edit	Elective	Correct title of UEENEEK148A Install, configure and commission LV grid connected photovoltaic power systems	40
4	Edit	Elective	Correct title of UEENEEK153A Assess energy loads and uses for energy efficiency in residential, office and retail premises	20
4	Edit	Elective	Correct title of UEENEEK154A Assess energy loads and uses for energy efficiency in commercial facilities	40
4	Edit	Elective	Correct title of UEENEEK155A Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40
4	Edit	Elective	Correct title of UEENEEM080A Report on the	20

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			integrity of explosion-protected equipment in a hazardous area	

5	Remove	Group C	UEENEEG197A - Apply currency of safe working practices and compliance verification of electrical installations	20
5	Remove	Group C	UEENEEG198A - Apply compliance requirements to all aspects of electrical work	20

Description

Scope

This qualification provides competencies to develop, select, commission, maintain and diagnose faults/malfunctions on advanced electrical equipment and systems. It includes ERAC requirements for an ‘Electrician’s licence’.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 600 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE084A	Write specifications for electrotechnology engineering projects	40
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1000**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 600 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	270
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units**	0	240
D	**Qualification Elective Units** You may select all your elective units from this Group	260	600

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 270		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20

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	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 270 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40
UEENEEA112A	Fabricate and assemble bus bars	40
UEENEEA113A	Mount and wire control panel equipment	40
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG113A	Install and maintain emergency safety systems	60
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG120A	Select and arrange equipment for special LV electrical installations	60
UEENEEG126A	Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEG150A	Wind electrical coils	40

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UEENEEG151A	Place and connect electrical coils	40
UEENEEG152A	Rewind single phase machines	40
UEENEEG153A	Rewind three phase low voltage induction machines	60
UEENEEG154A	Rewind LV direct current machines	60
UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEG165A	Maintain and service traction lifts systems and equipment	40
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40
UEENEEG167A	Align and install traction lift equipment	20
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEG189A	Install and maintain emergency lighting systems	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40

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UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20

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UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40
UETTDRIS44A	Perform HV field switching operation to a given schedule	40

Group C – Qualification Elective Units You may complete units to a maximum weighting of 240		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEG076A	Install and replace low voltage current transformer metering	20

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UEENEEG121A	Verify compliance and functionality of special LV electrical installations	40
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40
UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60
UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
UEENEEG156A	Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
UEENEEG158A	Conduct electrical tests on HV electrical machines	60
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEG172A	Investigate and report on electrical incidents and causes	60
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80
UEENEEG177A	Select low voltage power factor correction equipment	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEG184A	Provide photometric data for illumination system design	60

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UEENEEG185A	Select effective and efficient light sources and luminaries for given locations and designs	60
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings	20
UEENEEG188A	Prepare quotations for the supply of effective and efficient lighting products for lighting projects	20
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen	20
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20
UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external	40

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	devices	
UEENEEK135A	Design grid connected photovoltaic power supply systems	60
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations	20
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities	40
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

Group D – Qualification Elective Units You must complete units to a minimum weighting of 260 You may select all your elective units from this Group		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEG127A	Design electrical installations with a low voltage demand greater than 400 A per phase	40
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEG187A	Design effective and efficient lighting for public, open and sports areas	20

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UEENEEI127A	Analyse complex electronic circuits controlling fluids	80
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEK129A	Design renewable energy (RE) heating systems	120
UEENEEK131A	Design wind energy conversion systems (WECS) rated to 10 kW	60
UEENEEK138A	Design micro-hydro systems rated to 6.4 kW	60
UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment — coal mining	40
UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment — gas atmospheres	40
UEENEEM037A	Conduct a conformity assessment of explosion-protected equipment — dust atmospheres	40
UEENEEM064A	Conduct audit of hazardous areas installations — coal mining	60
UEENEEM065A	Conduct audit of hazardous areas installations — gas atmospheres	60
UEENEEM066A	Conduct audit of hazardous areas installations — dust atmospheres	60
UEENEEM067A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — coal mining	60
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — gas atmospheres	60
UEENEEM069A	Assess the fitness-for-purpose of hazardous areas	60

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	explosion-protected equipment — dust atmospheres	
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus	60
UETTDRIS70A	Diagnose and rectify faults in electrical energy distribution systems	60
UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission systems	60
UETTDRIS72A	Diagnose and rectify faults in distributed Generation systems	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE50511 Diploma of Electronics and Communications Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
2	Add	Group B	UEENEEI150A Develop, enter and verify discrete control programs for programmable controllers	60
2	Add	Group B	UEENEEH146A Solve fundamental electronic communications system problems	40
2	Add	Group C	UEENEEE124A Compile and produce an energy sector detailed report	60
2	Add	Group D	UEENEEH157A Develop basic plans for integrating security systems	40
2	Add	Group D	UEENEEH181A Design electronic printed circuit boards	40
2	Add	Group D	UEENEEE161A Analyse static and dynamic parameters of electrical equipment	80
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Edit		Edit Name to reflect correct Unit title UEENEEE117A Implement and monitor energy sector OHS policies and procedures	
2	Edit		Edit Name to reflect correct Unit title UEENEEE124A Compile and produce an energy	

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			sector detailed report	
2	Edit		Edit Name to reflect correct Unit title UEENEEK132A Develop strategies to address environmental and sustainability issues in the energy sector	
2	Update	Group A	MSS402001A Apply competitive systems and practices	20
2	Update	Group A	MSS402021A Apply Just in Time procedures	20
2	Update	Group A	MSS402080A Undertake root cause analysis	20
2	Update	Group A	MSS402081A Contribute to the application of a proactive maintenance strategy	20
2	Update	Group A	MSS402040A Apply 5S procedures	20
2	Update	Group A	MSS402020A Apply quick changeover procedures	20

3	Add	Group D	UEENEED111A - Develop, implement and test object oriented code	140
3	Add	Group B	UEENEED102A - Assemble, set-up and test computing devices	80
3	Add	Group B	UEENEEP025A - Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20
3	Add	Group D	UEENEEH189A - Provide Gate Array solutions for complex electronics systems	60

4	Add	Group B	UEENEEI101A Use instrumentation drawings, specification, standards and equipment manuals	40
4	Add	Group D	UEENEED147A Develop energy sector directory services	80
4	Edit	Core	Correct title of UEENEEH168A - Modify - redesign of electronics and communications systems	20
4	Edit	Core	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20

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4	Edit	Elective	Correct title of UEENEEE125A - Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Elective	Correct title of UEENEEH174A - Troubleshoot audio - video recording equipment	120
4	Edit	Elective	Correct title of UEENEEH183A - Analyse the performance of wireless-based electronic - communication systems	40
4	Edit	Elective	Correct title of UEENEEH188A - Design and develop electronics - computer systems projects	40

Description

Scope
This qualification provides competencies to develop, select, commission, maintain and diagnose faults/malfunctions of electronic components/sub-assemblies, apparatus and systems.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 1460 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH167A	Commission electronics and communications systems	20
UEENEEH168A	Modify - redesign of electronics and communications systems	20
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
Total points in core		**140**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 1460 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state	0	270

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	accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.		
B	**Qualification Elective Units**	0	920
C	**Qualification Elective Units**	260	580
D	**Qualification Elective Units**	280	1200

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 270		**Weighting Points**
BSBINM501A	Manage an information or knowledge management system	50
BSBINN502A	Build and sustain an innovative work environment	50
BSBMGT502B	Manage people performance	70
BSBMGT516C	Facilitate continuous improvement	60
BSBWOR502B	Ensure team effectiveness	60
ICTTEN3056A	Install telecommunications network equipment	40
MSS402001A	Apply competitive systems and practices	20
MSS402020A	Apply quick changeover procedures	20
MSS402021A	Apply Just in Time procedures	20
MSS402040A	Apply 5S procedures	20
MSS402080A	Undertake root cause analysis	20
MSS402081A	Contribute to the application of a proactive maintenance strategy	20
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20

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UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 270 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 920		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA103A	Set up and check electronic component assembly machines	40
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	20
UEENEEA106A	Use lead-free soldering techniques	40
UEENEEB101A	Operate and maintain amateur radio communication stations	40
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes	40

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	and specifications	
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF106A	Solve problems in voice and data communications circuits	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEF111A	Test, report and rectify faults in data and voice installations	40
UEENEEF114A	Set up and configure basic data communication systems	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH102A	Repairs basic electronic apparatus faults by	40

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	replacement of components	
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH104A	Set up and test residential video/audio equipment	40
UEENEEH105A	Verify functionality and compliance of custom electronic installations	40
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises	120
UEENEEH107A	Repair predictable faults in general electronic apparatus	40
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	60
UEENEEH109A	Set up and test gaming and game equipment	60
UEENEEH110A	Install commercial video/audio system components	120
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus	40
UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
UEENEEH118A	Fault find and repair electronic apparatus	40
UEENEEH119A	Repair predictable faults in television receivers	120
UEENEEH120A	Fault find and repair gaming and games equipment	80
UEENEEH121A	Fault find and repair high volume office equipment	120
UEENEEH122A	Fault find and repair remote control apparatus	60

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UEENEEH123A	Fault find and repair microwave heating apparatus	40
UEENEEH124A	Repair predictable faults in audio components	40
UEENEEH127A	Set up and adjust commercial radio frequency (RF) transmission and reception systems	60
UEENEEH128A	Install and test microwave antennae and waveguides	60
UEENEEH138A	Fault find and repair complex power supplies	40
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH142A	Solve oscillator problems	40
UEENEEH146A	Solve fundamental electronic communications system problems	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH154A	Program and commission commercial security systems	60
UEENEEH155A	Program and commission commercial access control security systems	60
UEENEEH156A	Program and commission commercial security closed circuit television systems	60
UEENEEH161A	Install fire detection and warning system apparatus	40
UEENEEH162A	Verify compliance and functionality of fire protection system installations	60
UEENEEH163A	Enter and verify programs for fire protection systems	40
UEENEEH164A	Commission large fire protection systems	40
UEENEEH165A	Troubleshoot fire protection systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100

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UEENEEH171A	Troubleshoot faults in television receivers	120
UEENEEH172A	Troubleshoot communication systems	80
UEENEEH173A	Troubleshoot professional audio reproduction components	120
UEENEEH174A	Troubleshoot audio - video recording equipment	120
UEENEEH187A	Solve problems in electronic musical equipment circuits	40
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI117A	Calibrate, adjust and test measuring instruments	40
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

Group C – Qualification Elective Units Complete units to a minimum weighting of 260 and a maximum weighting of 580		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED103A	Evaluate and modify object oriented code programs	40
UEENEED110A	Set up, create and implement content for a web server	120
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120

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UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEE118A	Establish, maintain and evaluate energy sector OHS systems	60
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEH129A	Fault find and repair navigation systems	60
UEENEEH130A	Fault find and repair satellite-based surveillance and observation systems	60
UEENEEH131A	Fault find and repair radar apparatus and systems	120
UEENEEH132A	Fault find and repair global positioning systems	60
UEENEEH133A	Fault find and repair telecommunication apparatus and systems	60
UEENEEH134A	Fault find and repair electronic medical equipment	120
UEENEEH135A	Design custom electronic equipment installations	120
UEENEEH136A	Design commercial video/audio installations	120
UEENEEH137A	Program and commission commercial video/audio systems	40
UEENEEH140A	Fault find and repair sonar apparatus and systems	120
UEENEEH153A	Program and test large security systems	120
UEENEEH175A	Troubleshooting in security system installations	60
UEENEEH176A	Diagnose and rectify faults in electronic display circuits	60
UEENEEH177A	Diagnose and rectify faults in recording and replay equipment	60
UEENEEH178A	Diagnose and rectify faults in camera circuits and equipment	60
UEENEEH179A	Diagnose and rectify faults in digital television circuits and apparatus	80

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UEENEEH180A	Diagnose and rectify faults in digital transmission circuits and systems	80
UEENEEH186A	Commission satellite and microwave communication systems	40
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEI157A	Configure and maintain industrial control system networks	60

Group D – Qualification Elective Units You must complete units to a minimum weighting of 280 and to a maximum of 1200 points		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEED147A	Develop energy sector directory services	80
UEENEED150A	Develop industrial control programs for microcomputer equipped devices	60
UEENEED151A	Provide programming solution for computer systems engineering problems	60
UEENEED155A	Develop and validate biometric equipment/systems installation	120
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEE072B	Write specifications for electronics and communications engineering projects	40

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UEENEEH145A	Develop engineering solutions to analogue electronic problems	80
UEENEEH148A	Design and develop advanced digital systems	40
UEENEEH149A	Develop engineering solutions to audio electronic problems	60
UEENEEH157A	Develop basic plans for integrating security systems	40
UEENEEH158A	Design integrated security systems	40
UEENEEH159A	Design integrated complex security systems for multiple sites	60
UEENEEH181A	Design electronic printed circuit boards	40
UEENEEH182A	Develop engineering solutions to RF amplifiers problems	40
UEENEEH183A	Analyse the performance of wireless-based electronic - communication systems	40
UEENEEH188A	Design and develop electronics - computer systems projects	40
UEENEEH190A	Provide engineering solutions to air traffic control system problems	40
UEENEEH191A	Diagnose and rectify faults in air navigation circuits and systems	120
UEENEEH192A	Develop solutions for air surveillance apparatus and systems	120
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80
UEENEED111A	Develop, implement and test object oriented code	140
UEENEEH189A	Provide Gate Array solutions for complex electronics systems	60

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Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE50711 Diploma of Renewable Energy Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20
4	Edit	Core	Correct title of UEENEEE074B Write specifications for renewable energy engineering projects	40
4	Edit	Core	Correct title of UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE124A Compile and produce an energy sector detailed report	60
4	Edit	Elective	Correct title of UEENEEC004B Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
4	Edit	Elective	Correct title of UEENEED101A Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEG131A Evaluate performance of low voltage electrical apparatus	40
4	Edit	Elective	Correct title of UEENEEH102A Repairs basic electronic apparatus faults by replacement of components	40

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4	Edit	Elective	Correct title of UEENEEI116A Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEK128A Solve problems in stand-alone renewable energy systems	60
4	Edit	Elective	Correct title of UEENEEK130A Solve problems in wind energy conversion systems rated up to 10 kW	60
4	Edit	Elective	Correct title of UEENEEK131A Design wind energy conversion systems (WECS) rated to 10 kW	60
4	Edit	Elective	Correct title of UEENEEK134A Install ELV stand-alone photovoltaic power systems	60
4	Edit	Elective	Correct title of UEENEEK135A Design grid connected photovoltaic power supply systems	60
4	Edit	Elective	Correct title of UEENEEK137A Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
4	Edit	Elective	Correct title of UEENEEK138A Design micro-hydro systems rated to 6.4 kW	60
4	Edit	Elective	Correct title of UEENEEK143A Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
4	Edit	Elective	Correct title of UEENEEK144A Install, configure and commission LV wind energy conversion systems rated up to 10 kW	40
4	Edit	Elective	Correct title of UEENEEK148A Install, configure and commission LV grid connected photovoltaic power systems	40
4	Edit	Elective	Correct title of UEENEEK153A Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
4	Edit	Elective	Correct title of UEENEEK154A Assess energy loads and uses for energy efficiency in commercial facilities	40
4	Edit	Elective	Correct title of UEENEEK155A Assess energy loads and uses for energy efficiency in industrial	40

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			properties and enterprises	

Description

Scope

This qualification provides competencies to develop, select, commission, maintain and diagnose faults/malfunctions on large scale renewable energy equipment and systems.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 520 points in accordance with the Elective Competency Standard Units table below.
- All the required prerequisite competency standard units

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE074B	Write specifications for renewable energy engineering projects	40
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80

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UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	80
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		1080

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 520 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	Imported and Common Elective Units Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	260
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units**	0	240
D	**Qualification Elective Units**	260	340

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 260		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or	Up to 260

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	state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK124A	Solve basic problems in micro hydro systems	20
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK127A	Diagnose and rectify faults in renewable energy control systems	60
UEENEEK128A	Solve problems in stand-alone renewable energy systems	60
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW	60
UEENEEK134A	Install ELV stand-alone photovoltaic power systems	60
UEENEEK136A	Install, configure and commission LV micro-hydro systems rated up to 6.4 kW	20
UEENEEK137A	Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
UEENEEK143A	Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
UEENEEK144A	Install, configure and commission LV wind energy conversion systems rated up to 10 kW	40

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UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40

Group C – Qualification Elective Units You may complete units to a maximum weighting of 240		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80
UEENEEK135A	Design grid connected photovoltaic power supply systems	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations	20
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities	40
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

Group D – Qualification Elective Units You must complete units to a minimum weighting of 260 to a maximum of 340		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEK129A	Design renewable energy (RE) heating systems	120

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UEENEEK131A	Design wind energy conversion systems (WECS) rated to 10 kW	60
UEENEEK138A	Design micro-hydro systems rated to 6.4 kW	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE50811 Diploma of Research and Development

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE124A - Compile and produce an energy sector detailed report	60
4	Edit	Core	Correct title of UEENEEK132A - Develop strategies to address environmental and sustainability issues in the energy sector	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80
4	Edit	Elective	Correct title of UEENEED103A - Evaluate and modify object oriented code programs	40
4	Edit	Elective	Correct title of UEENEED112A - Support computer hardware and software for engineering applications	120
4	Edit	Elective	Correct title of UEENEED113A - Install and administer Unix based networked computers	80
4	Edit	Elective	Correct title of UEENEED115A - Administer computer networks	80
4	Edit	Elective	Correct title of UEENEED117A - Install and configure network systems for internetworking	120
4	Edit	Elective	Correct title of UEENEED124A - Integrate multiple computer operating systems on a client server local	80

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			area network	
4	Edit	Elective	Correct title of UEENEED129A - Develop web pages for engineering applications	40
4	Edit	Elective	Correct title of UEENEED130A - Select, install, configure and test multimedia components	40
4	Edit	Elective	Correct title of UEENEED143A - Install and configure a client computer operating system and software	40
4	Edit	Elective	Correct title of UEENEED153A - Set up, configure and test biometric devices	40
4	Edit	Elective	Correct title of UEENEEE119A - Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
4	Edit	Elective	Correct title of UEENEEE123A - Solve basic problems electronic and digital equipment and circuits	80
4	Edit	Elective	Correct title of UEENEEE147A - Identify building techniques, methods and materials used in energy sector work activities	40
4	Edit	Elective	Correct title of UEENEEE192A - Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
4	Edit	Elective	Correct title of UEENEEG131A - Evaluate performance of low voltage electrical apparatus	40
4	Edit	Elective	Correct title of UEENEEH183A - Analyse the performance of wireless-based electronic - communication systems	40
4	Edit	Elective	Correct title of UEENEER006B - Contribute to the commercialisation of products/applications/ services	120

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Description

Scope

This qualification provides competencies to assist professional in-planning, research and development of electrotechnology products and services.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 880 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE084A	Write specifications for electrotechnology engineering projects	40
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
UEENEER001B	Contribute to the planning of a research project	120
UEENEER002B	Contribute to the conduct of a research project	120
UEENEER003B	Contribute to the development of a Product/Application/Service	120
UEENEER004B	Contribute to the trial of a Product/Application/Service	120
Total points in core		**720**

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 880 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	270
B	**Qualification Elective Units**	0	500
C	**Qualification Elective Units**	0	240
D	**Qualification Elective Units**	140	240

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 270		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20

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UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 270 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 500		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE130A	Provide solutions and report on routine electrotechnology problems	60
UEENEEE147A	Identify building techniques, methods and materials used in energy sector work activities	40
UEENEEE149A	Contribute to the operation of support plant and equipment used in electricity supply industry	40
UEENEEE151A	Transport apparatus, equipment and materials	60
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60

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Group C – Qualification Elective Units You may complete units to a maximum weighting of 240		**Weighting Points**
UEENEED103A	Evaluate and modify object oriented code programs	40
UEENEED113A	Install and administer Unix based networked computers	80
UEENEED117A	Install and configure network systems for internetworking	120
UEENEED124A	Integrate multiple computer operating systems on a client server local area network	80
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEI155A	Develop structured programs to control external devices	40

Group D – Qualification Elective Units You must complete units to a minimum weighting of 140 to a maximum of 240		**Weighting Points**
UEENEED115A	Administer computer networks	80
UEENEEE118A	Establish, maintain and evaluate energy sector OHS systems	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEH183A	Analyse the performance of wireless-based electronic - communication systems	40
UEENEER005B	Contribute to Intellectual Property Management	120

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UEENEER006B	Contribute to the commercialisation of products/applications/ services	120

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE50911 Diploma of Industrial Electronics and Control Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UEENEEH150A Assemble and set up basic security systems	80
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
4	Edit	Core	Correct title of UEENEEE101A - Apply	20

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			Occupational Health and Safety regulations, codes and practices in the workplace	
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE124A - Compile and produce an energy sector detailed report	60
4	Edit	Elective	Correct title of UEENEED101A Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEED110A Set up, create and implement content for a web server	120
4	Edit	Elective	Correct title of UEENEED111A Develop, implement and test object oriented code	140
4	Edit	Elective	Correct title of UEENEED144A Commission industrial computer systems	20
4	Edit	Elective	Correct title of UEENEED145A Modify-redesign of industrial computer systems	20
4	Edit	Elective	Correct title of UEENEEG110A Find and repair faults in LV d.c. electrical apparatus and circuits	60
4	Edit	Elective	Correct title of UEENEEG111A Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of UEENEEG113A Install and maintain emergency safety systems	60
4	Edit	Elective	Correct title of UEENEEG116A Diagnose and rectify faults in traction lift systems	80
4	Edit	Elective	Correct title of UEENEEG119A Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG129A Overhaul and repair major switchgear and controlgear	60
4	Edit	Elective	Correct title of UEENEEG131A Evaluate performance of low voltage electrical apparatus	40
4	Edit	Elective	Correct title of UEENEEG132A Carry out low voltage electrical field testing and report findings	60

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4	Edit	Elective	Correct title of UEENEEI103A Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI116A Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI119A Set up industrial field control devices	60
4	Edit	Elective	Correct title of UEENEEI126A Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI148A Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A Solve problems in polyphase electronic power control circuits	60

Description

Scope
This qualification provides competencies to develop, select, commission, maintain and diagnose faults/malfunctions of equipment and systems for the monitoring and control of plant, machines and processes.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

All the Core competency standard units, defined in the Core Competency Standard Units table below and

A combination of Elective competency standard units to achieve a total weighting of 480 points in accordance with the Elective Competency Standard Units table below.

All the required prerequisite competency standard units

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE075B	Write specifications for industrial electronics and control projects	40
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80

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UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
Total points in core		**1120**

Elective Competency Standard Units

Complete Elective units to achieve a total of weighting of 480 points from the following groups:

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Group		Minimum points	Maximum points
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	220
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units**	0	120
D	**Qualification Elective Units** You may select all your elective units from this Group	260	480

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20

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UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 220 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG113A	Install and maintain emergency safety systems	60
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEH102A	Repair basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40

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UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60

Group C – Qualification Elective Units You may complete units to a maximum weighting of 120		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED116A	Develop computer network services	120
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40

Group D – Qualification Elective Units	**Weighting**

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You must complete units to a minimum weighting of 260 You may select all your elective units from this Group		**Points**
UEENEED110A	Set up, create and implement content for a web server	120
UEENEED111A	Develop, implement and test object oriented code	140
UEENEED144A	Commission industrial computer systems	20
UEENEED145A	Modify-redesign of industrial computer systems	20
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE51011 Diploma of Instrumentation and Control Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group D	UEENEED152A Design embedded controller control systems	80
2	Edit	Core	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
2	Edit	Core	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
2	Edit	Core	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
2	Edit	Core	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
2	Edit	Core	Edit Name to reflect correct Unit title UEENEEI106A Set up and adjust PID control loops	40
2	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
2	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI114A Trouble shoot process control systems	60
3	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
3	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40

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3	Edit	Core	Correct title of UEENEEE117A - Implement and monitor energy sector OHS policies and procedures	20
3	Edit	Core	Correct title of UEENEEE119A - Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
3	Edit	Core	Correct title of UEENEEE124A - Compile and produce an energy sector detailed report	60
3	Edit	Core	Correct title of UEENEEI103A Solve problems in density/level measurement components and systems	40
3	Edit	Core	Correct title of UEENEEI107A Install instrumentation and control cabling and tubing	20
3	Edit	Core	Correct title of UEENEEK132A - Develop strategies to address environmental and sustainability issues in the energy sector	20
3	Edit	Core	Correct title of UEENEEP013A - Disconnect - reconnect control devices connected to low voltage installation wiring	60
3	Edit	Elective	Correct title of UEENEED101A Use computer applications relevant to a workplace	20
3	Edit	Elective	Correct title of UEENEED104A Use engineering applications software on personal computers	40
3	Edit	Elective	Correct title of UEENEED110A Set up, create and implement content for a web server	120
3	Edit	Elective	Correct title of UEENEED111A Develop, implement and test object oriented code	140
3	Edit	Elective	Correct title of UEENEED144A Commission industrial computer systems	20
3	Edit	Elective	Correct title of UEENEED145A Modify-redesign of industrial computer systems	20
3	Edit	Elective	Correct title of UEENEEG131A Evaluate performance of low voltage electrical apparatus	40
3	Edit	Elective	Correct title of UEENEEI115A Trouble shooting in medical equipment control systems	120

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3	Edit	Elective	Correct title of UEENEEI117A Calibrate, adjust and test measuring instruments	40
3	Edit	Elective	Correct title of UEENEEI122A Assist in commissioning process and instrumentation control systems	40
3	Edit	Elective	Correct title of UEENEEI126A Provide solutions to pneumatic-hydraulic system operations	80
3	Edit	Elective	Correct title of UEENEEI148A Solve problems in single phase electronic power control circuits	60

Description

Scope
This qualification provides competencies to install, set up, test, develop, select, commission, maintain and diagnose faults/malfunctions of equipment and systems for the measurement, recording, monitoring and control of physical/chemical phenomenon and related process control systems.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 480 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEI112A - Those holding an ‘Certificate III in Instrumentation and Control trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE075B	Write specifications for industrial electronics and control projects	40
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEI101A	Use instrumentation drawings, specification, standards and	40

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	equipment manuals	
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI106A	Set up and adjust PID control loops	40
UEENEEI107A	Install instrumentation and control cabling and tubing	20
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI110A	Set up and adjust advanced PID process control loops	40
UEENEEI111A	Find and rectify faults in process final control elements	40
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations	40
UEENEEI113A	Setup and configure human-machine interface (HMI) and industrial networks	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
UEENEEP013A	Disconnect - reconnect control devices connected to low voltage installation wiring	60
Total points in core		**1120**

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 480 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	180
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units**	0	120
D	**Qualification Elective Units** You may select all your elective units from this Group	260	480

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 180		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance	20

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	program processes	
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 180 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEI114A	Trouble shoot process control systems	60
UEENEEI115A	Trouble shooting in medical equipment control systems	120
UEENEEI117A	Calibrate, adjust and test measuring instruments	40
UEENEEI118A	Set up weighting measuring and control instruments	20
UEENEEI131A	Set up gas analysis measuring and control instruments	20
UEENEEI132A	Set up water analysis measuring and control instruments	20
UEENEEI133A	Set up scientific analysis measuring and control instruments	20
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60

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UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 120		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED116A	Develop computer network services	120
UEENEEI121A	Trouble shoot in measuring and analysis systems	40
UEENEEI122A	Assist in commissioning process and instrumentation control systems	40
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEM078A	Manage compliance of hazardous areas	20
UEENEEM038A	Conduct testing of hazardous areas installations — coal	40

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	mining	
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40
UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM043A	Conduct detailed inspection of hazardous areas installations — coal mining	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	40
UEENEEM045A	Conduct detailed inspection of hazardous areas installations — dust atmospheres	40
UEENEEM046A	Conduct detailed inspection of hazardous areas installations — pressurisation	40

Group D – Qualification Elective Units You must complete units to a minimum weighting of 260 You may select all your elective units from this Group		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEED110A	Set up, create and implement content for a web server	120
UEENEED111A	Develop, implement and test object oriented code	140
UEENEED144A	Commission industrial computer systems	20
UEENEED145A	Modify-redesign of industrial computer systems	20
UEENEED152A	Design embedded controller control systems	80
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEI127A	Analyse complex electronic circuits controlling fluids	80

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UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE51111 Diploma of Engineering Technology - Refrigeration and Air-conditioning

Modification History

Release	Action	Core/Elective	Details	Points
3	Add	Group A	CPPBDN5013A Develop and collaborate on building information models for small-scale building design projects	100
3	Add	Group D	UEENEEE129A Solve electrotechnical engineering problems	60
3	Add	Group D	UEENEEK151A Develop effective engineering strategies for energy reduction in buildings	60
3	Add	Group D	UEENEEE150A Undertake computations in an energy sector environment	120
3	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Update	Group A	HLTCPR211A Perform CPR Perform CPR	10
5	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
5	Edit	Elective	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20

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Description

Scope

This qualification provides enabling competencies to develop systems and select equipment for heating, ventilation, air conditioning and/or refrigeration systems.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 680 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEE147A	Identify building techniques, methods and materials used in energy sector work activities	40
UEENEEJ127A	Establish the thermodynamic parameters of refrigeration and air conditioning systems	80
UEENEEJ128A	Produce HVAC/R system design drawings	80
UEENEEJ129A	Establish heat loads for commercial refrigeration and/or air conditioning applications	80
UEENEEJ131A	Determine noise and vibration encountered in HVAC/R applications	80

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UEENEEJ164A	Analyse the operation of HVAC air and hydronic systems	80
UEENEEJ165A	Evaluate thermodynamic and fluid parameters of refrigeration systems	100
UEENEEJ192A	Analyse the psychrometric performance of HVAC/R systems	50
UEENEEJ193A	Analyse the thermodynamic performance of HVAC/R systems	50
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**920**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 680 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	270
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units**	60	170
D	**Qualification Elective Units**	270	620

Group A – Imported and Common Electives Units You may complete units to a maximum weighting of 270		**Weighting Points**
UEENEEC001B	Maintain documentation	20

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UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
CPCCOHS1001A	Work safely in the construction industry	10
CPPBDN5013A	Develop and collaborate on building information models for small-scale building design projects	100
HLTAID001	Provide cardiopulmonary resuscitation	10
MEM16006A	Organise and communicate information	20
MEM16008A	Interact with computing technology	20
MEM30001A	Use computer aided drafting systems to produce basic engineering drawings	40
MEM30002A	Produce basic engineering graphics	40
MEM30003A	Produce detailed engineering drawings	80
MEM30004A	Use CAD to create and display 3D models	40
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1,Volume 1 Qualification Framework	Up to 270 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant	10
UEENEEJ184A	Apply safety awareness and legal requirements for Carbon Dioxide refrigerant	10

Group C – Qualification Elective Units Complete units to a minimum weighting of 60 and a maximum weighting of 170		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEJ130A	Produce HVAC/R control system diagrams	40
UEENEEJ190A	Select basic commercial refrigeration system equipment, components and accessories	40
UEENEEJ191A	Select residential air conditioning system equipment, components and accessories	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20

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Group D – Qualification Elective Units You must complete units to a minimum weighting of 270 and a maximum weighting of 620		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE129A	Solve electrotechnical engineering problems	60
UEENEEJ132A	Design commercial refrigeration systems and select components	80
UEENEEJ133A	Design industrial refrigeration systems and select components	80
UEENEEJ134A	Design heating, ventilation and air conditioning (HVAC) systems and select components	60
UEENEEJ135A	Design control systems for refrigeration or heating, ventilation and air conditioning systems	80
UEENEEJ136A	Evaluate and report on building services energy management systems	80
UEENEEJ137A	Evaluate and report on the indoor air quality of buildings	40
UEENEEJ177A	Design hydrocarbon refrigerated systems	40
UEENEEJ181A	Design ammonia refrigerated systems	40
UEENEEJ183A	Design secondary refrigerant systems	40
UEENEEJ187A	Design carbon dioxide refrigerated systems	40
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	60
UEENEEE150A	Undertake computations in an energy sector environment	120

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.

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3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.

END OF QUALIFICATION

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UEE51211 Diploma of Air-conditioning and Refrigeration Engineering

Modification History

Release	Action	Core/Elective	Details	Points
5	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
5	Edit	Core	Correct title of UEENEEJ102A - Prepare and connect refrigerant tubing and fittings	30
5	Edit	Core	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20
5	Edit	Elective	Correct title of UEENEEJ191A - Select residential air conditioning system equipment, components and accessories	40

Description

Scope
This qualification provides competencies to develop systems, select equipment, and commission, maintain and diagnose faults/malfunctions of refrigeration systems and equipment that apply to commercial food storage and preservation and air conditioning and air distribution equipment and special applications. It includes regulatory requirements for purchasing and handling refrigerants.
Note:
The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

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Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 130 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEJ109A - Those holding an ‘Certificate III in Refrigeration and Air-conditioning trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour	60

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	compression systems	
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment	80
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations	20
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components	40
UEENEEJ113A	Commission air conditioning and refrigeration systems	40
UEENEEJ127A	Establish the thermodynamic parameters of refrigeration and air conditioning systems	80
UEENEEJ129A	Establish heat loads for commercial refrigeration and/or air conditioning applications	80
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ164A	Analyse the operation of HVAC air and hydronic systems	80
UEENEEJ165A	Evaluate thermodynamic and fluid parameters of refrigeration systems	100
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70
UEENEEJ192A	Analyse the psychrometric performance of HVAC/R systems	50
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40

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UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	60
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20
Total points in core		**1470**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 130 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	60
B	**Qualification Elective Units**	0	30
C	**Qualification Elective Units**	0	50
D	**Qualification Elective Units** You may select the majority of your elective units from this Group	50	130

Group A – Imported and Common Electives Units You may complete units to a maximum weighting of 60	**Weighting Points**

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BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
MEM16006A	Organise and communicate information	20
MEM16008A	Interact with computing technology	20
MEM30001A	Use computer aided drafting systems to produce basic engineering drawings	40
MEM30002A	Produce basic engineering graphics	40
MEM30003A	Produce detailed engineering drawings	80
MEM30004A	Use CAD to create and display 3D models	40
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 60 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 30		**Weighting Points**
UEENEEJ114A	Resolve problems in hydronic systems	40
UEENEEJ115A	Resolve problems in beverage dispensers	40
UEENEEJ116A	Resolve problems in transport refrigeration systems	20
UEENEEJ117A	Resolve problems in ultra-low temperature refrigeration systems	20
UEENEEJ118A	Resolve problems in post mix refrigeration systems	20
UEENEEJ119A	Resolve problems in ice making systems	20
UEENEEJ166A	Resolve problems in dairy refrigeration systems	20
UEENEEJ167A	Resolve problems in central plant air conditioning systems	40
UEENEEJ168A	Maintain microbial control of refrigeration and air conditioning systems	20
UEENEEJ171A	Resolve problems in refrigerated beverage vending cabinets	20
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10
UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	20
UEENEEJ176A	Install and commission hydrocarbon refrigeration systems, components and associated equipment	20
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant	10
UEENEEJ179A	Repair and service ammonia refrigeration systems	20
UEENEEJ180A	Install and commission ammonia refrigeration systems, components and associated equipment	20
UEENEEJ182A	Repair and service secondary refrigeration systems	20
UEENEEJ184A	Apply safety awareness and legal requirements for	10

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	carbon dioxide refrigerant	
UEENEEJ185A	Repair and service carbon dioxide refrigeration systems	20
UEENEEJ186A	Install and commission carbon dioxide refrigeration systems, components and associated equipment	20
UEENEEJ188A	Repair and service self contained carbon dioxide refrigeration and heat pump systems	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 50		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEJ128A	Produce HVAC/R system design drawings	80
UEENEEJ130A	Produce HVAC/R control system diagrams	40
UEENEEJ190A	Select basic commercial refrigeration system equipment, components and accessories	40
UEENEEJ191A	Select residential air conditioning system equipment, components and accessories	40

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Group D – Qualification Elective Units You must complete units to a minimum weighting of 50 You may select all your elective units from this Group		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEJ131A	Determine noise and vibration encountered in HVAC/R applications	80
UEENEEJ132A	Design commercial refrigeration systems and select components	80
UEENEEJ133A	Design industrial refrigeration systems and select components	80
UEENEEJ134A	Design heating, ventilation and air conditioning (HVAC) systems and select components	60
UEENEEJ135A	Design control systems for refrigeration or heating, ventilation and air conditioning systems	80
UEENEEJ136A	Evaluate and report on building services energy management systems	80
UEENEEJ137A	Evaluate and report on the indoor air quality of buildings	40
UEENEEJ177A	Design hydrocarbon refrigerated systems	40
UEENEEJ181A	Design ammonia refrigerated systems	40
UEENEEJ183A	Design secondary refrigerant systems	40
UEENEEJ187A	Design carbon dioxide refrigerated systems	40

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.

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END OF QUALIFICATION

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UEE53011 Diploma of Electrical Systems Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UETTDRIS67A Solve problems in energy supply network equipment	80
2	Add	Group B	UETTDRIS68A Solve problems in energy supply network protection equipment and systems	40
2	Add	Group B	UETTDRIS44A Perform HV field switching operation to a given schedule	60
2	Add	Group D	UETTDRIS69A Diagnose and rectify faults in energy supply apparatus	60
2	Add	Group D	UETTDRIS70A Diagnose and rectify faults in electrical energy distribution systems	60
2	Add	Group D	UETTDRIS71A Diagnose and rectify faults in electrical energy supply transmission systems	60
2	Add	Group D	UETTDRIS72A Diagnose and rectify faults in distributed Generation systems	60
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40

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3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60

5	Edit	Core	Correct title of UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
5	Edit	Core	Correct title of UEENEEE102A Fabricate, assemble and dismantle utilities industry components	40
5	Edit	Core	Correct title of UEENEEE124A Compile and produce an energy sector detailed report	60
5	Edit	Core	Correct title of UEENEEG199A Conduct compliance and functional verification of electrical apparatus and existing circuits	20
5	Edit	Elective	Correct title of UEENEEA110A Assemble, mount and connect control gear and switchgear	40
5	Edit	Elective	Correct title of UEENEEA112A Fabricate and assemble bus bars	60
5	Edit	Elective	Correct title of UEENEEA113A Mount and wire control panel equipment	40
5	Edit	Elective	Correct title of UEENEED101A Use computer applications relevant to a workplace	20
5	Edit	Elective	Correct title of UEENEEG110A Find and repair faults in LV d.c. electrical apparatus and circuits	60
5	Edit	Elective	Correct title of UEENEEG111A Carry out basic repairs to electrical components and equipment	40
5	Edit	Elective	Correct title of UEENEEG116A Diagnose and	80

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			rectify faults in traction lift systems	
5	Edit	Elective	Correct title of UEENEEG119A Maintain operation of electrical marine equipment and systems	60
5	Edit	Elective	Correct title of UEENEEG127A Design electrical installations with a low voltage demand greater than 400 A per phase	40
5	Edit	Elective	Correct title of UEENEEG128A Plan low voltage switchboard and control panel layouts	40
5	Edit	Elective	Correct title of UEENEEG129A Overhaul and repair major switchgear and controlgear	60
5	Edit	Elective	Correct title of UEENEEG131A Evaluate performance of low voltage electrical apparatus	40
5	Edit	Elective	Correct title of UEENEEG153A Rewind three phase low voltage induction machines	60
5	Edit	Elective	Correct title of UEENEEG155A Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
5	Edit	Elective	Correct title of UEENEEG156A Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
5	Edit	Elective	Correct title of UEENEEG159A Conduct mechanical tests on electrical machines and components	40
5	Edit	Elective	Correct title of UEENEEG164A Repair and maintain mechanical components of electrical machines	40
5	Edit	Elective	Correct title of UEENEEG165A Maintain and service traction lifts systems and equipment	40
5	Edit	Elective	Correct title of UEENEEG166A Install and maintain escalators, moving walks and treadways	40
5	Edit	Elective	Correct title of UEENEEG167A Align and install traction lift equipment	20
5	Edit	Elective	Correct title of UEENEEG168A Diagnose and rectify faults in complex lift systems	40

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5	Edit	Elective	Correct title of UEENEEH102A Repairs basic electronic apparatus faults by replacement of components	40
5	Edit	Elective	Correct title of UEENEEI101A Use instrumentation drawings, specification, standards and equipment manuals	40
5	Edit	Elective	Correct title of UEENEEI103A Solve problems in density/level measurement components and systems	40
5	Edit	Elective	Correct title of UEENEEI107A Install instrumentation and control cabling and tubing	20
5	Edit	Elective	Correct title of UEENEEI116A Assemble, enter and verify operating instructions in microprocessor equipped devices	20
5	Edit	Elective	Correct title of UEENEEI119A Set up industrial field control devices	60
5	Edit	Elective	Correct title of UEENEEI126A Provide solutions to pneumatic-hydraulic system operations	80
5	Edit	Elective	Correct title of UEENEEI148A Solve problems in single phase electronic power control circuits	60
5	Edit	Elective	Correct title of UEENEEI149A Solve problems in polyphase electronic power control circuits	60
5	Edit	Elective	Correct title of UEENEEJ153A Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
5	Edit	Elective	Correct title of UEENEEM074A Plan electrical installations in hazardous areas - Coal mining	20
5	Edit	Elective	Correct title of UETTDRIS44A Perform HV field switching operation to a given schedule	40

Description

Scope

This qualification provides competencies to develop, select, commission, maintain and diagnose faults/malfunctions on advanced electrical equipment and systems.

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Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 640 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG199A - Those holding an 'Electrical Fitter Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE071B	Write specifications for electrical engineering projects	40
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80

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UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG199A	Conduct compliance and functional verification of electrical apparatus and existing circuits	40
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**960**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 640 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	270

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 640 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	270
B	**Qualification Elective Units**	0	140
C	**Qualification Elective Units**	0	240
D	**Qualification Elective Units** You may select all your elective units from this Group	260	640

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 270		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20

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UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 5. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 270 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 140		**Weighting Points**
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40
UEENEEA112A	Fabricate and assemble bus bars	60
UEENEEA113A	Mount and wire control panel equipment	40
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF115A	Assemble and connect telecommunication frames and cabinets	60
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEG150A	Wind electrical coils	40
UEENEEG151A	Place and connect electrical coils	40
UEENEEG152A	Rewind single phase machines	40
UEENEEG153A	Rewind three phase low voltage induction machines	60

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UEENEEG154A	Rewind LV direct current machines	60
UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEG165A	Maintain and service traction lifts systems and equipment	40
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40
UEENEEG167A	Align and install traction lift equipment	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI107A	Install instrumentation and control cabling and	20

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	tubing	
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ105A	Position, assemble and start up single head split air conditioning and water heating heat pump systems	70
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60
UEENEEJ151A	Service small electrical appliances and power tools	60
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ154A	Find and rectify faults in appliance control systems and devices	60
UEENEEJ155A	Service refrigeration appliances	60
UEENEEJ156A	Service clothes washing machines and dryers	40
UEENEEJ157A	Service electrical heating appliances	60
UEENEEJ158A	Service dishwasher machines	40
UEENEEJ159A	Service gas heating appliances	40
UEENEEJ162A	Recover, pressure test, evacuate, charge and leak test refrigerants - appliances	50

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UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70
UEENEEJ173A	Service and repair microwave ovens	40
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40
UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances	50
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM031A	Overhaul and repair of explosion-protected equipment — coal mining	60
UEENEEM032A	Overhaul and repair of explosion-protected equipment — flameproof enclosures	60
UEENEEM033A	Overhaul and repair of explosion-protected equipment — gas atmospheres	60
UEENEEM034A	Overhaul and repair of explosion-protected equipment — dust atmospheres	40
UEENEEM060A	Carry out overhaul and repair of explosion-protected equipment — coal mining	60

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UEENEEM061A	Carry out overhaul and repair of explosion-protected equipment — flameproof enclosures	60
UEENEEM062A	Carry out overhaul and repair of explosion-protected equipment — gas atmospheres	60
UEENEEM063A	Carry out overhaul and repair of explosion-protected equipment — dust atmospheres	60
UEENEEM070A	Repair reeling, trailing and flexible cables	60
UEENEEM071A	Test reeling, trailing and flexible cables	60
UEENEEM072A	Inspect and fit plugs/couplers for reeling, trailing and flexible cables	60
UEENEEM073A	Verify compliance of repaired reeling, trailing and flexible cables	60
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
UEENEEN102A	Assemble and wire internal electrical rail signalling equipment	30
UETTDRIS43A	Perform low voltage field switching operation to a given schedule.	50
UETTDRIS44A	Perform HV field switching operation to a given schedule	40
UETTDRIS47A	Sample, test, filter and reinstate insulating oil	40
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40
UETTDRSB29A	Maintain capacitor bank equipment for voltage regulation	40

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UETTDRSB39A	Perform power system substation switching operation to a given schedule	50

Group C – Qualification Elective Units You may complete units to a maximum weighting of 240		**Weighting Points**
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
UEENEEG156A	Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
UEENEEG158A	Conduct electrical tests on HV electrical machines	60
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60

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UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40
UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM043A	Conduct detailed inspection of hazardous areas installations — coal mining	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	40
UEENEEM045A	Conduct detailed inspection of hazardous areas installations — dust atmospheres	40
UEENEEM046A	Conduct detailed inspection of hazardous areas installations — pressurisation	40
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	20
UEENEEM048A	Develop and manage maintenance programs for hazardous areas electrical equipment — gas atmospheres	20
UEENEEM049A	Develop and manage maintenance programs for hazardous areas electrical equipment — dust atmospheres	20
UEENEEM050A	Develop and manage maintenance programs for hazardous areas electrical equipment — pressurisation	20

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UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	20
UEENEEM055A	Plan electrical installations for hazardous areas — dust atmospheres	20
UEENEEM056A	Plan electrical installations for hazardous areas — pressurisation	20
UEENEEM074A	Plan electrical installations in hazardous areas - Coal mining	20
UEENEEM078A	Manage compliance of hazardous areas	20

Group D – Qualification Elective Units You must complete units to a minimum weighting of 260 You may select all your elective units from this Group		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEG127A	Design electrical installations with a low voltage demand greater than 400 A per phase	40
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEG187A	Design effective and efficient lighting for public, open and sports areas	20
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60

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UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment — coal mining	40
UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment — gas atmospheres	40
UEENEEM037A	Conduct a conformity assessment of explosion-protected equipment — dust atmospheres	40
UEENEEM064A	Conduct audit of hazardous areas installations — coal mining	60
UEENEEM065A	Conduct audit of hazardous areas installations — gas atmospheres	60
UEENEEM066A	Conduct audit of hazardous areas installations — dust atmospheres	60
UEENEEM067A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — coal mining	60
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — gas atmospheres	60
UEENEEM069A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — dust atmospheres	60
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus	60
UETTDRIS70A	Diagnose and rectify faults in electrical energy distribution systems	60
UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission systems	60
UETTDRIS72A	Diagnose and rectify faults in distributed Generation systems	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.

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In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
Registered training organisations shall provide competency development advice in relation to any licensing requirements to practice that apply, or can contribute towards the qualification requirement, prior to establishing the competency development plan.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE60211 Advanced Diploma of Electronics and Communications Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
2	Add	Group E	UEENEEE081A Apply material science to solving electrotechnology engineering problems	60
2	Add	Group E	UEENEEE082A Apply physics to solving electrotechnology engineering problems	60
2	Add	Group B	UEENEEF106A Solve problems in voice and data communications circuits	40
2	Add	Group D	UEENEED147A Develop energy sector directory services	80
2	Add	Group D	UEENEEH188A Design and develop electronics/ computer systems projects	40
2	Add	Group D	UEENEEE161A Analyse static and dynamic parameters of electrical equipment	80
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Edit		Edit Name to reflect correct Unit title UEENEEE117A Implement and monitor energy sector OHS policies and procedures	
2	Edit		Edit Name to reflect correct Unit title UEENEEE124A Compile and produce an energy sector detailed report	

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2	Edit		Edit Name to reflect correct Unit title UEENEEK132A Develop strategies to address environmental and sustainability issues in the energy sector	
2	Update	Group A	MSS402001A Apply competitive systems and practices	20
2	Update	Group A	MSS402021A Apply Just in Time procedures	20
2	Update	Group A	MSS402080A Undertake root cause analysis	20
2	Update	Group A	MSS402081A Contribute to the application of a proactive maintenance strategy	20
2	Update	Group A	MSS402040A Apply 5S procedures	20
2	Update	Group A	MSS402020A Apply quick changeover procedures	20

3	Add	Group D	UEENEED111A Develop, implement and test object oriented code	140
3	Add	Group B	UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

4	Add	Group D	UEENEEH190A Provide engineering solutions to air traffic control system problems	80
4	Add	Group D	UEENEEH191A Diagnose and rectify faults in air navigation circuits and systems	120
4	Add	Group D	UEENEEH192A Develop solutions for air surveillance apparatus and systems	120
4	Add	Group B	UEENEEI150A Develop, enter and verify discrete control programs for programmable controllers	60
4	Add	Group C	UEENEEK145A Implement and monitor energy sector environmental and sustainable energy policies and procedures	20
4	Edit	Core	Correct title of UEENEEE015B - Develop design briefs for electrotechnology projects	40

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4	Edit	Core	Correct title of UEENEEH168A - Modify - redesign of electronics and communications systems	20
4	Edit	Core	Correct title of UEENEEH188A - Design and develop electronics - computer systems projects	40
4	Edit	Elective	Correct title of UEENEEE125A - Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Elective	Correct title of UEENEEH174A - Troubleshoot audio - video recording equipment	120
4	Edit	Elective	Correct title of UEENEEH183A - Analyse the performance of wireless-based electronic - communication systems	40
4	Edit	Elective	Correct title of UEENEEI154A - Design and use advanced programming tools PC networks and HMI Interfacing	120

Description

Scope
This qualification provides competencies to design and validate/evaluate electronics and communication equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 1880 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE078B	Contribute to risk management in electrotechnology systems	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH141A	Manage computer systems/electronics projects	40
UEENEEH167A	Commission electronics and communications systems	20
UEENEEH168A	Modify - redesign of electronics and communications systems	20
UEENEEH188A	Design and develop electronics/ computer systems projects	40
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**280**

Elective Competency Standard Units

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Complete Elective units to achieve a total of weighting of 1880 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	360
B	**Qualification Elective Units**	0	900
C	**Qualification Elective Units**	0	280
D	**Qualification Elective Units**	0	260
E	**Qualification Elective Units**	520	1320

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 360		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
ICTTEN3056A	Install telecommunications network equipment	40
MSS402001A	Apply competitive systems and practices	20
MSS402020A	Apply quick changeover procedures	20
MSS402021A	Apply Just in Time procedures	20
MSS402040A	Apply 5S procedures	20

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MSS402080A	Undertake root cause analysis	20
MSS402081A	Contribute to the application of a proactive maintenance strategy	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 360 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 900		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA103A	Set up and check electronic component assembly machines	40
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	20
UEENEEA106A	Use lead-free soldering techniques	40
UEENEEB101A	Operate and maintain amateur radio communication stations	40
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	40
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes	40

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	and specifications	
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF106A	Solve problems in voice and data communications circuits	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEF111A	Test, report and rectify faults in data and voice installations	40
UEENEEF114A	Set up and configure basic data communication systems	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH102A	Repairs basic electronic apparatus faults by	40

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	replacement of components	
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH104A	Set up and test residential video/audio equipment	40
UEENEEH105A	Verify functionality and compliance of custom electronic installations	40
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises	120
UEENEEH107A	Repair predictable faults in general electronic apparatus	40
UEENEEH108A	Assemble and install reception antennae and signal distribution equipment	60
UEENEEH109A	Set up and test gaming and game equipment	60
UEENEEH110A	Install commercial video/audio system components	120
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus	40
UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
UEENEEH118A	Fault find and repair electronic apparatus	40
UEENEEH119A	Repair predictable faults in television receivers	120
UEENEEH120A	Fault find and repair gaming and games equipment	80
UEENEEH121A	Fault find and repair high volume office equipment	120
UEENEEH122A	Fault find and repair remote control apparatus	60

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UEENEEH123A	Fault find and repair microwave heating apparatus	40
UEENEEH124A	Repair predictable faults in audio components	40
UEENEEH127A	Set up and adjust commercial radio frequency (RF) transmission and reception systems	60
UEENEEH128A	Install and test microwave antennae and waveguides	60
UEENEEH138A	Fault find and repair complex power supplies	40
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH142A	Solve oscillator problems	40
UEENEEH146A	Solve fundamental electronic communications system problems	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH154A	Program and commission commercial security systems	60
UEENEEH155A	Program and commission commercial access control security systems	60
UEENEEH156A	Program and commission commercial security closed circuit television systems	60
UEENEEH161A	Install fire detection and warning system apparatus	40
UEENEEH162A	Verify compliance and functionality of fire protection system installations	60
UEENEEH163A	Enter and verify programs for fire protection systems	40
UEENEEH164A	Commission large fire protection systems	40
UEENEEH165A	Troubleshoot fire protection systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100

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UEENEEH171A	Troubleshoot faults in television receivers	120
UEENEEH172A	Troubleshoot communication systems	80
UEENEEH173A	Troubleshoot professional audio reproduction components	120
UEENEEH174A	Troubleshoot audio - video recording equipment	120
UEENEEH187A	Solve problems in electronic musical equipment circuits	40
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI117A	Calibrate, adjust and test measuring instruments	40
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 280		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED103A	Evaluate and modify object oriented code programs	40
UEENEED110A	Set up, create and implement content for a web server	120
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120
UEENEEE110A	Develop and implement energy sector maintenance	60

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	programs	
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEE118A	Establish, maintain and evaluate energy sector OHS systems	60
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEH129A	Fault find and repair navigation systems	60
UEENEEH130A	Fault find and repair satellite-based surveillance and observation systems	60
UEENEEH131A	Fault find and repair radar apparatus and systems	120
UEENEEH132A	Fault find and repair global positioning systems	60
UEENEEH133A	Fault find and repair telecommunication apparatus and systems	60
UEENEEH134A	Fault find and repair electronic medical equipment	120
UEENEEH135A	Design custom electronic equipment installations	120
UEENEEH136A	Design commercial video/audio installations	120
UEENEEH137A	Program and commission commercial video/audio systems	40
UEENEEH140A	Fault find and repair sonar apparatus and systems	120
UEENEEH153A	Program and test large security systems	120
UEENEEH175A	Troubleshooting in security system installations	60
UEENEEH176A	Diagnose and rectify faults in electronic display circuits	60
UEENEEH177A	Diagnose and rectify faults in recording and replay equipment	60
UEENEEH178A	Diagnose and rectify faults in camera circuits and equipment	60
UEENEEH179A	Diagnose and rectify faults in digital television circuits and apparatus	80
UEENEEH180A	Diagnose and rectify faults in digital transmission	80

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	circuits and systems	
UEENEEH186A	Commission satellite and microwave communication systems	40
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20

Group D – Qualification Elective Units You may complete units to a maximum weighting of 260		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEED111A	Develop, implement and test object oriented code	140
UEENEED147A	Develop energy sector directory services	80
UEENEED150A	Develop industrial control programs for microcomputer equipped devices	60
UEENEED151A	Provide programming solution for computer systems engineering problems	60
UEENEED155A	Develop and validate biometric equipment/systems installation	120
UEENEEE072B	Write specifications for electronics and communications engineering projects	40
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80

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Group D – Qualification Elective Units You may complete units to a maximum weighting of 260		**Weighting Points**
UEENEEH145A	Develop engineering solutions to analogue electronic problems	80
UEENEEH148A	Design and develop advanced digital systems	40
UEENEEH149A	Develop engineering solutions to audio electronic problems	60
UEENEEH157A	Develop basic plans for integrating security systems	40
UEENEEH158A	Design integrated security systems	40
UEENEEH159A	Design integrated complex security systems for multiple sites	60
UEENEEH181A	Design electronic printed circuit boards	40
UEENEEH182A	Develop engineering solutions to RF amplifiers problems	40
UEENEEH183A	Analyse the performance of wireless-based electronic - communication systems	40
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEH190A	Provide engineering solutions to air traffic control system problems	40
UEENEEH191A	Diagnose and rectify faults in air navigation circuits and systems	120
UEENEEH192A	Develop solutions for air surveillance apparatus and systems	120

Group E – Qualification Elective Units You must complete units to a minimum weighting of 520 to a maximum of 1320		**Weightin g Points**
UEENEEC007B	Manage contract variations	40

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Group E – Qualification Elective Units You must complete units to a minimum weighting of 520 to a maximum of 1320		**Weighting Points**
UEENEED152A	Design embedded controller control systems	80
UEENEEE011C	Manage risk in electrotechnology activities	100
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE128A	Develop engineering solutions to photonic system problems	80
UEENEEE129A	Solve electrotechnical engineering problems	60
UEENEED149A	Develop energy sector computer network applications infrastructure	80
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEH147A	Assess electronic apparatus compliance	60
UEENEEH160A	Plan large electronic projects	60
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80
UEENEEH185A	Design signal-conditioning subsystems	80
UEENEEH189A	Provide Gate Array solutions for complex electronics systems	60
UEENEEI123A	Design electronic control systems	60
UEENEEI130A	Set up electronically controlled robotically operated complex systems	80

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Group E – Qualification Elective Units You must complete units to a minimum weighting of 520 to a maximum of 1320		**Weighting Points**
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Interfacing	120

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE60411 Advanced Diploma of Computer Systems Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group E	UEENEEE081A Apply material science to solving electrotechnology engineering problems	60
2	Add	Group E	UEENEEE082A Apply physics to solving electrotechnology engineering problems	60
2	Add	Group B	UEENEEF110A Select and arrange data and voice equipment for local area networks	40
2	Add	Group C	UEENEED116A Develop computer network services	120
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
3	Add	Group E	UEENEEH189A Provide Gate Array solutions for complex electronics systems	60
4	Add	Group A	ICTTEN4210A Implement and troubleshoot enterprise routers and switches	100
4	Add	Group A	ICTTEN4211A Design, install and configure an internetwork	100
4	Add	Group A	ICTTEN4212A Apply advanced routing protocols to network design	80
4	Add	Group A	ICTTEN4213A Configure and troubleshoot advanced network switching	80
4	Add	Group A	ICTTEN4214A Install and maintain a wide	80

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			area network	
4	Add	Group C	UEENEEK145A Implement and monitor energy sector environmental and sustainable energy policies and procedures	20
4	Edit	Core	Correct title of UEENEEE015B - Develop design briefs for electrotechnology projects	40
4	Edit	Core	Correct title of UEENEEH188A - Design and develop electronics - computer systems projects	40
4	Edit	Elective	Correct title of UEENEEE125A - Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Elective	Correct title of UEENEEH183A - Analyse the performance of wireless-based electronic - communication systems	40

5	Update	Group A	Correct core/elective metadata mapping ICTTEN4210A Implement and troubleshoot enterprise routers and switches	
5	Update	Group A	Correct core/elective metadata mapping ICTTEN4211A Design, install and configure an internetwork	
5	Update	Group A	Correct core/elective metadata mapping ICTTEN4212A Apply advanced routing protocols to network design	
5	Update	Group A	Correct core/elective metadata mapping ICTTEN4213A Configure and troubleshoot advanced network switching	
5	Update	Group A	Correct core/elective metadata mapping ICTTEN4214A Install and maintain a wide area network	

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Description

Scope
This qualification provides competencies to design, install/validate/evaluate and administer computer equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 1880 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED144A	Commission industrial computer systems	20
UEENEED145A	Modify-redesign of industrial computer systems	20
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE078B	Contribute to risk management in electrotechnology systems	20
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH141A	Manage computer systems/electronics projects	40
UEENEEH188A	Design and develop electronics - computer systems projects	40
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**280**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 1880 points from the

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following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	360
B	**Qualification Elective Units**	0	900
C	**Qualification Elective Units**	0	280
D	**Qualification Elective Units**	0	280
E	**Qualification Elective Units** You may select the majority of your elective units from this Group	420	1600

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 360		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
ICTTEN4210A	Implement and troubleshoot enterprise routers and switches	100
ICTTEN4211A	Design, install and configure an internetwork	100
ICTTEN4212A	Apply advanced routing protocols to network design	80
ICTTEN4213A	Configure and troubleshoot advanced network	80

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	switching	
ICTTEN4214A	Install and maintain a wide area network	80
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 360 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 900		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA106A	Use lead-free soldering techniques	40
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE123A	Solve basic problems electronic and digital	80

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	equipment and circuits	
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH150A	Assemble and set up basic security systems	80

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UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 280		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED103A	Evaluate and modify object oriented code programs	40
UEENEED110A	Set up, create and implement content for a web server	120
UEENEED113A	Install and administer Unix based networked computers	80
UEENEED115A	Administer computer networks	80
UEENEED116A	Develop computer network services	120
UEENEED117A	Install and configure network systems for internetworking	120
UEENEED124A	Integrate multiple computer operating systems on a client server local area network	80
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120
UEENEEE110A	Develop and implement energy sector maintenance programs	60

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UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable energy policies and procedures	20

Group D – Qualification Elective Units You may complete units to a maximum weighting of 280		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEED111A	Develop, implement and test object oriented code	140
UEENEED118A	Design and implement network systems for internetworking	120
UEENEED150A	Develop industrial control programs for microcomputer equipped devices	60
UEENEED151A	Provide programming solution for computer systems engineering problems	60
UEENEEE070B	Write specifications for computer systems engineering projects	40
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEED147A	Develop energy sector directory services	80
UEENEEH145A	Develop engineering solutions to analogue electronic problems	80

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Group D – Qualification Elective Units You may complete units to a maximum weighting of 280		**Weighting Points**
UEENEEH148A	Design and develop advanced digital systems	40
UEENEEH157A	Develop basic plans for integrating security systems	40
UEENEEH181A	Design electronic printed circuit boards	40
UEENEEH183A	Analyse the performance of wireless-based electronic - communication systems	40
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI156A	Develop and test code for microcontroller devices	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 420 to a maximum of 1600		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEED114A	Design and manage enterprise computer networks	80
UEENEED119A	Design and implement advanced routing for internetworking systems	100
UEENEED120A	Design and implement remote access for Internetworking systems	100
UEENEED121A	Design and implement multi-layer switching for Internetworking systems	100
UEENEED122A	Design and implement security for Internetworking systems	100
UEENEED123A	Design and implement wireless LANs/WANs for internetworking systems	100
UEENEED148A	Plan industrial computer systems projects	60
UEENEED152A	Design embedded controller control systems	80
UEENEED155A	Develop and validate biometric equipment/systems installation	120

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Group E – Qualification Elective Units You must complete units to a minimum weighting of 420 to a maximum of 1600		**Weighting Points**
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE128A	Develop engineering solutions to photonic system problems	80
UEENEEE129A	Solve electrotechnical engineering problems	60
UEENEED149A	Develop energy sector computer network applications infrastructure	80
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80
UEENEEH185A	Design signal-conditioning subsystems	80
UEENEEH189A	Provide Gate Array solutions for complex electronics systems	60
UEENEEI154A	Design and use advanced programming tools PC networks and HMI interfacing	120

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.

END OF QUALIFICATION

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Custom Content Section

Not applicable.

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UEE60611 Advanced Diploma of Industrial Electronics and Control Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Edit		Edit Name to reflect correct Unit title UEENEEE117A Implement and monitor energy sector OHS policies and procedures	
2	Edit		Edit Name to reflect correct Unit title UEENEEE124A Compile and produce an energy sector detailed report	
2	Edit		Edit Name to reflect correct Unit title UEENEEK132A Develop strategies to address environmental and sustainability issues in the energy sector	

3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title	40

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			UEENEEI105A Solve problems in temperature measurement components and systems	
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60

4	Edit	Core	Correct title of UEENEEI134A Manage instrumentation and control projects	40
4	Edit	Core	Correct title of UEENEEI135A Plan instrumentation and control projects	60
4	Edit	Elective	Correct title of UEENEEE127A Use advanced computational processes to provide solutions to energy sector engineering problems	80
4	Edit	Elective	Correct title of UEENEEE128A Develop engineering solutions to photonic system problems	80
4	Edit	Elective	Correct title of UEENEEE161A Analyse static and dynamic parameters of electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE162A Select drive components for electrical equipment design	80
4	Edit	Elective	Correct title of UEENEEE163A Analyse materials for suitability in electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE192A Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
4	Edit	Elective	Correct title of UEENEEG110A Find and repair faults in LV d.c. electrical apparatus and circuits	60
4	Edit	Elective	Correct title of UEENEEG111A Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of UEENEEG116A Diagnose and rectify faults in traction lift systems	80
4	Edit	Elective	Correct title of UEENEEG119A Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG131A Evaluate	40

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			performance of low voltage electrical apparatus	
4	Edit	Elective	Correct title of UEENEEG132A Carry out low voltage electrical field testing and report findings	60
4	Edit	Elective	Correct title of UEENEEG143A Develop engineering solution for synchronous machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG144A Develop engineering solutions for d.c. machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG145A Develop engineering solutions for induction machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG161A Design and develop modifications to LV electrical machines	60
4	Edit	Elective	Correct title of UEENEEG168A Diagnose and rectify faults in complex lift systems	40
4	Edit	Elective	Correct title of UEENEEG177A Select low voltage power factor correction equipment	40
4	Edit	Elective	Correct title of UEENEEH102A Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEH147A Assess electronic apparatus compliance	60
4	Edit	Elective	Correct title of UEENEEH150A Assemble and set up basic security systems	80
4	Edit	Elective	Correct title of UEENEEH184A Modify digital signal processing (DSP) based sub-systems	80
4	Edit	Elective	Correct title of UEENEEH185A Design signal-conditioning subsystems	80
4	Edit	Elective	Correct title of UEENEEH188A Design and develop electronics - computer systems projects	40
4	Edit	Elective	Correct title of UEENEEI101A Use instrumentation drawings, specification, standards and equipment manuals	40

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4	Edit	Elective	Correct title of UEENEEI103A Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI116A Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI119A Set up industrial field control devices	60
4	Edit	Elective	Correct title of UEENEEI123A Design electronic control systems	60
4	Edit	Elective	Correct title of UEENEEI126A Provide solutions to pneumatic-hydraulic system operations	60
4	Edit	Elective	Correct title of UEENEEI128A Set up and configure controls on complex fluid systems	80
4	Edit	Elective	Correct title of UEENEEI148A Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A Solve problems in polyphase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
4	Edit	Elective	Correct title of UEENEEI154A Design and use advanced programming tools PC networks and HMI Interfacing	120
4	Edit	Elective	Correct title of UEENEEM039A Conduct testing of hazardous areas installations - gas atmospheres	40
4	Edit	Elective	Correct title of UEENEEM079A Design of gas detection systems	20
4	Edit	Elective	Correct title of UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area	20

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Description

Scope

This qualification provides competencies to design and validate/evaluate control equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 360 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE006B	Apply methods to maintain currency of industry developments	20
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE075B	Write specifications for industrial electronics and control projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40

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UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60

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UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI134A	Manage instrumentation and control projects	40
UEENEEI135A	Plan instrumentation and control projects	60
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1800**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 360 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	180
B	**Qualification Elective Units**	0	60
C	**Qualification Elective Units**	0	100
D	**Qualification Elective Units**	0	60
E	**Qualification Elective Units** You may select all your elective units from this Group	160	360

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Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 180		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 180 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI116A	Assemble, enter and verify operating instructions in	20

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	microprocessor equipped devices	
UEENEEI138A	Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	60
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEG132A	Carry out low voltage electrical field testing and	60

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	report findings	
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEG177A	Select low voltage power factor correction equipment	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEM039A	Conduct testing of hazardous areas installations - gas atmospheres	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	40
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	20
UEENEEM078A	Manage compliance of hazardous areas	20

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Group D – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEI127A	Analyse complex electronic circuits controlling fluids	80
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment — coal mining	40
UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment — gas atmospheres	40
UEENEEM037A	Conduct a conformity assessment of explosion-protected equipment — dust atmospheres	40
UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	20
UEENEEM064A	Conduct audit of hazardous areas installations — coal mining	60
UEENEEM065A	Conduct audit of hazardous areas installations — gas atmospheres	60
UEENEEM066A	Conduct audit of hazardous areas installations — dust	60

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	atmospheres	
UEENEEM067A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — coal mining	60
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — gas atmospheres	60
UEENEEM069A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — dust atmospheres	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 160 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE128A	Develop engineering solutions to photonic system problems	80
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80
UEENEEE162A	Select drive components for electrical equipment design	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEE164A	Design electrical machine drives and production layout plans	80
UEENEEE078B	Contribute to risk management in electrotechnology systems	20
UEENEEG143A	Develop engineering solution for synchronous machine and control problems	60
UEENEEG144A	Develop engineering solutions for d.c. machine and control problems	60

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UEENEEG145A	Develop engineering solutions for induction machine and control problems	60
UEENEEG160A	Evaluate performance of LV electrical machines	40
UEENEEG161A	Design and develop modifications to LV electrical machines	60
UEENEEH147A	Assess electronic apparatus compliance	60
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80
UEENEEH185A	Design signal-conditioning subsystems	80
UEENEEH188A	Design and develop electronics - computer systems projects	40
UEENEEI123A	Design electronic control systems	60
UEENEEI128A	Set up and configure controls on complex fluid systems	80
UEENEEI129A	Set up electronically controlled mechanically operated complex systems	80
UEENEEI130A	Set up electronically controlled robotically operated complex systems	80
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Interfacing	120
UEENEEM052A	Classify hazardous areas — gas atmospheres	40
UEENEEM053A	Classify hazardous areas — dust atmospheres	40
UEENEEM057A	Design explosion-protected electrical systems and installations — gas atmospheres	20
UEENEEM058A	Design explosion-protected electrical systems and installations — dust atmospheres	20
UEENEEM059A	Design explosion-protected electrical systems and installations — pressurisation	20
UEENEEM075A	Design explosion-protected electrical systems — Coal	20

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	mining	
UEENEEM079A	Design of gas detection systems	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE60911 Advanced Diploma of Renewable Energy Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group D	UEENEEE161A Analyse static and dynamic parameters of electrical equipment	80
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
4	Edit	Core	Correct title of UEENEEE074B Write specifications for renewable energy engineering projects	40
4	Edit	Core	Correct title of UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE117A Implement and monitor energy sector OHS policies and procedures	20
4	Edit	Core	Correct title of UEENEEE125A Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Core	Correct title of UEENEEK128A Solve problems in stand-alone renewable energy systems	60
4	Edit	Elective	Correct title of UEENEEE127A Use advanced computational processes to provide solutions to energy sector engineering problems	80

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4	Edit	Elective	Correct title of UEENEEE163A Analyse materials for suitability in electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE192A Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
4	Edit	Elective	Correct title of UEENEEG125A Plan electrical installations with a low voltage demand up to 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG127A Design electrical installations with a low voltage demand greater than 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG128A Plan low voltage switchboard and control panel layouts	40
4	Edit	Elective	Correct title of UEENEEG130A Design switchboards rated for high fault levels (greater than 400 A)	60
4	Edit	Elective	Correct title of UEENEEG132A Carry out low voltage electrical field testing and report findings	60
4	Edit	Elective	Correct title of UEENEEG177A Select low voltage power factor correction equipment	40
4	Edit	Elective	Correct title of UEENEEH102A Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEI116A Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
4	Edit	Elective	Correct title of UEENEEK130A Solve problems in wind energy conversion systems rated up to 10 kW	60
4	Edit	Elective	Correct title of UEENEEK134A Install ELV stand-alone photovoltaic power systems	60
4	Edit	Elective	Correct title of UEENEEK135A Design grid	60

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			connected photovoltaic power supply systems	
4	Edit	Elective	Correct title of UEENEEK137A Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
4	Edit	Elective	Correct title of UEENEEK138A Design micro-hydro systems rated to 6.4 kW	60
4	Edit	Elective	Correct title of UEENEEK139A Design stand-alone renewable energy (RE) systems	40
4	Edit	Elective	Correct title of UEENEEK140A Develop engineering solutions to renewable energy (RE) problems	60
4	Edit	Elective	Correct title of UEENEEK143A Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
4	Edit	Elective	Correct title of UEENEEK144A Install, configure and commission LV wind energy conversion systems rated up to 10 kW	40
4	Edit	Elective	Correct title of UEENEEK146A Design energy management controls for electrical installations in buildings	80
4	Edit	Elective	Correct title of UEENEEK148A Install, configure and commission LV grid connected photovoltaic power systems	40
4	Edit	Elective	Correct title of UEENEEK151A Develop effective engineering strategies for energy reduction in buildings	60
4	Edit	Elective	Correct title of UEENEEK153A Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
4	Edit	Elective	Correct title of UEENEEK154A Assess energy loads and uses for energy efficiency in commercial facilities	40
4	Edit	Elective	Correct title of UEENEEK155A Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

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Description

Scope
This qualification provides competencies to design and validate/evaluate renewable energy equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 340 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE006B	Apply methods to maintain currency of industry developments	20
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE074B	Write specifications for renewable energy engineering projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40

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UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60

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UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEK121A	Manage renewable energy (RE) projects	40
UEENEEK122A	Plan renewable energy (RE) projects	60
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	80
UEENEEK128A	Solve problems in stand-alone renewable energy systems	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1820**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 340 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
B	**Qualification Elective Units**	0	60
C	**Qualification Elective Units**	0	100
D	**Qualification Elective Units**	0	60
E	**Qualification Elective Units**	160	340

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 340 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
	You may select all your elective units from this Group		

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 170		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 170 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK124A	Solve basic problems in micro hydro systems	20
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK127A	Diagnose and rectify faults in renewable energy control systems	60
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW	60
UEENEEK134A	Install ELV stand-alone photovoltaic power systems	60
UEENEEK136A	Install, configure and commission LV micro-hydro systems rated up to 6.4 kW	20
UEENEEK137A	Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
UEENEEK143A	Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
UEENEEK144A	Install, configure and commission LV wind energy conversion systems rated up to 10 kW	40

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UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40

Group C – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEG076A	Install and replace low voltage current transformer metering	20
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80
UEENEEG177A	Select low voltage power factor correction equipment	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEK135A	Design grid connected photovoltaic power supply systems	60
UEENEEK152A	Develop strategies to address sustainability issues for electrical installations	20
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises	40

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UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities	40
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40

Group D – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEG127A	Design electrical installations with a low voltage demand greater than 400 A per phase	40
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEG187A	Design effective and efficient lighting for public, open and sports areas	20
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEK129A	Design renewable energy (RE) heating systems	120
UEENEEK131A	Design wind energy conversion systems (WECS) rated to 10 kW	60
UEENEEK138A	Design micro-hydro systems rated to 6.4 kW	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 160 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEE012B	Manage electrotechnology projects	40
UEENEEE013B	Plan electrotechnology projects	60
UEENEEE078B	Contribute to risk management in electrotechnology	20

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	systems	
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEG130A	Design switchboards rated for high fault levels (greater than 400 A)	60
UEENEEK133A	Design hybrid renewable power systems	80
UEENEEK139A	Design stand-alone renewable energy (RE) systems	40
UEENEEK140A	Develop engineering solutions to renewable energy (RE) problems	60
UEENEEK146A	Design energy management controls for electrical installations in buildings	80
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	60
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE61111 Advanced Diploma of Automated Systems Maintenance Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Update	Group A	HLTCPR211A Perform CPR	10
2	Update	Group A	Edit Unit Code to reflect correct Unit Code TLILIC2001 Licence to operate a forklift truck	10
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI106A Set up and adjust PID control loops	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI110A Set up and adjust advanced PID	40

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			process control loops	
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60

4	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE119A - Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
4	Edit	Core	Correct title of UEENEEE125A - Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Core	Correct title of UEENEEI136A - Manage automated control systems projects	40
4	Edit	Core	Correct title of UEENEEI137A - Plan automated and control systems projects	60
4	Edit	Core	Correct title of UEENEEI138A - Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	60
4	Edit	Core	Correct title of UEPOPS416B - Monitor the implementation of the enterprise's production-maintenance quality control procedures	20
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80
4	Edit	Elective	Correct title of UEENEEE127A - Use advanced computational processes to provide solutions to energy sector engineering problems	80

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4	Edit	Elective	Correct title of UEENEEE128A - Develop engineering solutions to photonic system problems	80
4	Edit	Elective	Correct title of UEENEEE161A - Analyse static and dynamic parameters of electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE162A - Select drive components for electrical equipment design	80
4	Edit	Elective	Correct title of UEENEEE163A - Analyse materials for suitability in electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE192A - Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
4	Edit	Elective	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of UEENEEG131A - Evaluate performance of low voltage electrical apparatus	40
4	Edit	Elective	Correct title of UEENEEG143A - Develop engineering solution for synchronous machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG144A - Develop engineering solutions for d.c. machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG145A - Develop engineering solutions for induction machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG161A - Design and develop modifications to LV electrical machines	60
4	Edit	Elective	Correct title of UEENEEG164A - Repair and maintain mechanical components of electrical machines	40
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEH111A - Troubleshoot single phase input d.c. power supplies	40
4	Edit	Elective	Correct title of UEENEEH147A - Assess electronic	60

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			apparatus compliance	
4	Edit	Elective	Correct title of UEENEEH150A - Assemble and set up basic security systems	80
4	Edit	Elective	Correct title of UEENEEH184A - Modify digital signal processing (DSP) based sub-systems	80
4	Edit	Elective	Correct title of UEENEEH185A - Design signal-conditioning subsystems	80
4	Edit	Elective	Correct title of UEENEEH188A - Design and develop electronics - computer systems projects	40
4	Edit	Elective	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI107A - Install instrumentation and control cabling and tubing	20
4	Edit	Elective	Correct title of UEENEEI108A - Install instrumentation and control apparatus and associated equipment	20
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI119A - Set up industrial field control devices	60
4	Edit	Elective	Correct title of UEENEEI123A - Design electronic control systems	60
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI128A - Set up and configure controls on complex fluid systems	80
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60

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4	Edit	Elective	Correct title of UEENEEI154A - Design and use advanced programming tools PC networks and HMI Interfacing	120
4	Edit	Elective	Correct title of UEENEEP026A - Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Description

Scope
This qualification provides competencies to monitor/validate/evaluate automated equipment and systems, manage risk, develop and manage maintenance programs, and provide technical advice.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

All the Core competency standard units, defined in the Core Competency Standard Units table below and

A combination of Elective competency standard units to achieve a total weighting of 1040 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE077B	Write specifications for automated systems projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20

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UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEI138A	Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	60
UEENEEI136A	Manage automated control systems projects	40
UEENEEI137A	Plan automated and control systems projects	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
UEPOPS202B	Apply Quality Systems To Work	20
UEPOPS337B	Maintain Quality Systems within the Team	20
UEPOPS416B	Monitor the implementation of the enterprise's production-maintenance quality control procedures	20
Total points in core		**1120**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 1040 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	360
B	**Qualification Elective Units**	0	280
C	**Qualification Elective Units**	0	220
D	**Qualification Elective Units**	0	220
E	**Qualification Elective Units** You may select all your elective units from this Group	320	1040

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 360		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE009B	Comply with scheduled and preventative maintenance program processes	20

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UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
BSBCUS401B	Coordinate implementation of customer service strategies	40
BSBINM401A	Implement workplace information system	40
BSBLED401A	Develop teams and individuals	40
BSBMGT402A	Implement operational plan	40
BSBMGT403A	Implement continuous improvement	40
BSBWOR401A	Establish effective workplace relationships	50
BSBWOR404A	Develop Work Priorities	40
TLILIC2001A	Licence to operate a forklift truck	40
HLTAID001	Provide cardiopulmonary resuscitation	10
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 360 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 280		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20

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UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI106A	Set up and adjust PID control loops	40
UEENEEI107A	Install instrumentation and control cabling and tubing	20
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI110A	Set up and adjust advanced PID process control loops	40
UEENEEI111A	Find and rectify faults in process final control elements	40
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations	40
UEENEEI113A	Setup and configure human-machine interface (HMI) and industrial networks	60
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

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UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20
UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external	40

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	devices	

Group D – Qualification Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEI127A	Analyse complex electronic circuits controlling fluids	80
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 320 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE128A	Develop engineering solutions to photonic system problems	80

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UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80
UEENEEE162A	Select drive components for electrical equipment design	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEE164A	Design electrical machine drives and production layout plans	80
UEENEEE078B	Contribute to risk management in electrotechnology systems	20
UEENEEG143A	Develop engineering solution for synchronous machine and control problems	60
UEENEEG144A	Develop engineering solutions for d.c. machine and control problems	60
UEENEEG145A	Develop engineering solutions for induction machine and control problems	60
UEENEEG160A	Evaluate performance of LV electrical machines	40
UEENEEG161A	Design and develop modifications to LV electrical machines	60
UEENEEH147A	Assess electronic apparatus compliance	60
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80
UEENEEH185A	Design signal-conditioning subsystems	80
UEENEEH188A	Design and develop electronics - computer systems projects	40
UEENEEI123A	Design electronic control systems	60
UEENEEI128A	Set up and configure controls on complex fluid systems	80
UEENEEI129A	Set up electronically controlled mechanically operated complex systems	80

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UEENEEI130A	Set up electronically controlled robotically operated complex systems	80
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Interfacing	120

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE61211 Advanced Diploma of Engineering - Explosion protection

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
4	Edit	Core	Correct title of UEENEEM080A - Report on the integrity of explosion-protected equipment in a hazardous area	20
4	Edit	Elective	Correct title of UEENEEE127A - Use advanced computational processes to provide solutions to energy sector engineering problems	80
4	Edit	Elective	Correct title of UEENEEE161A - Analyse static and dynamic parameters of electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE162A - Select drive components for electrical equipment design	80
4	Edit	Elective	Correct title of UEENEEE163A - Analyse materials for suitability in electrical equipment	80
4	Edit	Elective	Correct title of UEENEEG131A - Evaluate performance of low voltage electrical apparatus	40
4	Edit	Elective	Correct title of UEENEEG143A - Develop engineering solution for synchronous machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG144A - Develop engineering solutions for d.c. machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG145A - Develop engineering solutions for induction machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG161A - Design and	60

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			develop modifications to LV electrical machines	
4	Edit	Elective	Correct title of UEENEEM039A - Conduct testing of hazardous areas installations - gas atmospheres	40
4	Edit	Elective	Correct title of UEENEEM079A - Design of gas detection systems	20

Description

Scope

This qualification provides competencies to assess and manage risk associated with hazardous areas, design and validate/evaluate explosion protection aspects of electrical and instrument systems, audit explosion-protected installations and provide explosion protection technical advice/sales.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 380 points in accordance with the Elective Competency Standard Units table below.

Note:
UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meets the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE006B	Apply methods to maintain currency of industry developments	20
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE071B	Write specifications for electrical engineering projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40

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UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60

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UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEG169A	Manage large electrical projects	40
UEENEEG170A	Plan large electrical projects	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
UEENEEM052A	Classify hazardous areas — gas atmospheres	40
UEENEEM053A	Classify hazardous areas — dust atmospheres	40
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
Total points in core		**1780**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 380 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
B	**Qualification Elective Units**	0	60
C	**Qualification Elective Units**	0	80
D	**Qualification Elective Units**	0	60

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 380 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
E	**Qualification Elective Units** You may select all your elective units from this Group	160	380

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 170		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
PMASUP410B	Develop plant documentation	30
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology	Up to 170 points

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	Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40

Group C – Qualification Elective Units You may complete units to a maximum weighting of 80	**Weighting Points**

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UEENEEC005B	Estimate electrotechnology projects	40
UEENEEM039A	Conduct testing of hazardous areas installations - gas atmospheres	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	40
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	20
UEENEEM078A	Manage compliance of hazardous areas	20

Group D – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment — coal mining	40
UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment — gas atmospheres	40
UEENEEM037A	Conduct a conformity assessment of explosion-protected equipment — dust atmospheres	40
UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	20
UEENEEM064A	Conduct audit of hazardous areas installations — coal mining	60
UEENEEM065A	Conduct audit of hazardous areas installations — gas atmospheres	60
UEENEEM066A	Conduct audit of hazardous areas installations — dust	60

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	atmospheres	
UEENEEM067A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — coal mining	60
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — gas atmospheres	60
UEENEEM069A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — dust atmospheres	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 160 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80
UEENEEE162A	Select drive components for electrical equipment design	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEE164A	Design electrical machine drives and production layout plans	80
UEENEEE078B	Contribute to risk management in electrotechnology systems	20
UEENEEG143A	Develop engineering solution for synchronous machine and control problems	60
UEENEEG144A	Develop engineering solutions for d.c. machine and control problems	60
UEENEEG145A	Develop engineering solutions for induction machine and control problems	60
UEENEEG160A	Evaluate performance of LV electrical machines	40

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UEENEEG161A	Design and develop modifications to LV electrical machines	60
UEENEEM057A	Design explosion-protected electrical systems and installations — gas atmospheres	20
UEENEEM058A	Design explosion-protected electrical systems and installations — dust atmospheres	20
UEENEEM059A	Design explosion-protected electrical systems and installations — pressurisation	20
UEENEEM075A	Design explosion-protected electrical systems — Coal mining	20
UEENEEM079A	Design of gas detection systems	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE61511 Advanced Diploma of Instrumentation and Control Engineering

Modification History

Release	Action	Core/Elective	Details	Points
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI106A Set up and adjust PID control loops	40
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI110A Set up and adjust advanced PID process control loops	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEE117A Implement and monitor energy sector OHS policies and procedures	20
3	Edit	Core	Edit Name to reflect correct Unit title UEENEEE124A Compile and produce an energy sector detailed report	60

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3	Edit	Core	Edit Name to reflect correct Unit title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	60
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEED101A Use computer applications relevant to a workplace	20
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI114A Trouble shoot process control systems	60
3	Edit	Core	Edit Name to reflect correct Unit title UEENEED104A Use software for engineering applications	40

4	Edit	Core	Correct title of UEENEED104A - Use engineering applications software on personal computers	40
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE117A - Implement and monitor energy sector OHS policies and procedures	20
4	Edit	Core	Correct title of UEENEEE124A - Compile and produce an energy sector detailed report	60
4	Edit	Core	Correct title of UEENEEE125A - Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Core	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Core	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Core	Correct title of UEENEEI107A - Install instrumentation and control cabling and tubing	20

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4	Edit	Core	Correct title of UEENEEI108A - Install instrumentation and control apparatus and associated equipment	20
4	Edit	Core	Correct title of UEENEEI124A - Fault find and repair analogue circuits and components in electronic control systems	60
4	Edit	Core	Correct title of UEENEEK132A - Develop strategies to address environmental and sustainability issues in the energy sector	20
4	Edit	Core	Correct title of UEENEEP013A - Disconnect - reconnect control devices connected to low voltage installation wiring	60
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEED110A - Set up, create and implement content for a web server	120
4	Edit	Elective	Correct title of UEENEED111A - Develop, implement and test object oriented code	140
4	Edit	Elective	Correct title of UEENEED144A - Commission industrial computer systems	20
4	Edit	Elective	Correct title of UEENEED145A - Modify-redesign of industrial computer systems	20
4	Edit	Elective	Correct title of UEENEEE127A - Use advanced computational processes to provide solutions to energy sector engineering problems	80
4	Edit	Elective	Correct title of UEENEEE128A - Develop engineering solutions to photonic system problems	80
4	Edit	Elective	Correct title of UEENEEE161A - Analyse static and dynamic parameters of electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE162A - Select drive components for electrical equipment design	80
4	Edit	Elective	Correct title of UEENEEE163A - Analyse materials for suitability in electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE192A - Produce detailed electrotechnology /utilities drawings using computer	60

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			aided design equipment and software	
4	Edit	Elective	Correct title of UEENEEG131A - Evaluate performance of low voltage electrical apparatus	40
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEH147A - Assess electronic apparatus compliance	60
4	Edit	Elective	Correct title of UEENEEH184A - Modify digital signal processing (DSP) based sub-systems	80
4	Edit	Elective	Correct title of UEENEEH185A - Design signal-conditioning subsystems	80
4	Edit	Elective	Correct title of UEENEEH188A - Design and develop electronics - computer systems projects	40
4	Edit	Elective	Correct title of UEENEEI115A - Trouble shooting in medical equipment control systems	120
4	Edit	Elective	Correct title of UEENEEI117A - Calibrate, adjust and test measuring instruments	40
4	Edit	Elective	Correct title of UEENEEI121A - Trouble shoot in measuring and analysis systems	40
4	Edit	Elective	Correct title of UEENEEI122A - Assist in commissioning process and instrumentation control systems	40
4	Edit	Elective	Correct title of UEENEEI123A - Design electronic control systems	60
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI128A - Set up and configure controls on complex fluid systems	80
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60

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4	Edit	Elective	Correct title of UEENEEI154A - Design and use advanced programming tools PC networks and HMI Interfacing	120
4	Edit	Elective	Correct title of UEENEEM079A - Design of gas detection systems	20

Description

Scope

This qualification provides competencies to design and validate/evaluate process control equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales. It's also provides competencies to install, set up, test, develop, select, commission, maintain, diagnose faults/malfunctions of equipment and systems.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 420 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEI112A - Those holding an ‘Certificate III in Instrumentation and Control trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE006B	Apply methods to maintain currency of industry developments	20
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE075B	Write specifications for industrial electronics and control projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40

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UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits	40
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI106A	Set up and adjust PID control loops	40
UEENEEI107A	Install instrumentation and control cabling and tubing	20
UEENEEI108A	Install instrumentation and control apparatus and associated equipment	20
UEENEEI110A	Set up and adjust advanced PID process control loops	40
UEENEEI111A	Find and rectify faults in process final control elements	40

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UEENEEI112A	Verify compliance and functionality of instrumentation and control installations	40
UEENEEI113A	Setup and configure human-machine interface (HMI) and industrial networks	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI134A	Manage instrumentation and control projects	40
UEENEEI135A	Plan instrumentation and control projects	60
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
UEENEEP013A	Disconnect - reconnect control devices connected to low voltage installation wiring	60
Total points in core		**1740**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 420 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
B	**Qualification Elective Units**	0	80
C	**Qualification Elective Units**	0	80

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Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 420 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	170
D	**Qualification Elective Units**	0	80
E	**Qualification Elective Units** You may select all your elective units from this Group	180	420

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 170		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the	Up to 170 points

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	NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEI114A	Trouble shoot process control systems	60
UEENEEI115A	Trouble shooting in medical equipment control systems	120
UEENEEI117A	Calibrate, adjust and test measuring instruments	40
UEENEEI118A	Set up weighting measuring and control instruments	20
UEENEEI131A	Set up gas analysis measuring and control instruments	20
UEENEEI132A	Set up water analysis measuring and control instruments	20
UEENEEI133A	Set up scientific analysis measuring and control instruments	20
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring	60

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	systems — coal mining	
UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM076A	Use and maintain the integrity of a portable gas detection device	20
UEENEEM077A	Install and maintain the integrity of fixed gas detection equipment	20
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEI121A	Trouble shoot in measuring and analysis systems	40
UEENEEI122A	Assist in commissioning process and instrumentation control systems	40
UEENEEI125A	Provide solutions to fluid circuit operations	60

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UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM039A	Conduct testing of hazardous areas installations — gas atmospheres	40
UEENEEM040A	Conduct testing of hazardous areas installations — dust atmospheres	40
UEENEEM041A	Conduct testing of hazardous area installations — pressurisation	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM043A	Conduct detailed inspection of hazardous areas installations — coal mining	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	40
UEENEEM045A	Conduct detailed inspection of hazardous areas installations — dust atmospheres	40
UEENEEM046A	Conduct detailed inspection of hazardous areas installations — pressurisation	40
UEENEEM078A	Manage compliance of hazardous areas	20

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Group D – Qualification Elective Units You may complete units to a maximum weighting of 80		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEED116A	Develop computer network services	120
UEENEED110A	Set up, create and implement content for a web server	120
UEENEED111A	Develop, implement and test object oriented code	140
UEENEED144A	Commission industrial computer systems	20
UEENEED145A	Modify-redesign of industrial computer systems	20
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEI127A	Analyse complex electronic circuits controlling fluids	80
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment — coal mining	40
UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment — gas atmospheres	40
UEENEEM037A	Conduct a conformity assessment of explosion-protected equipment — dust atmospheres	40
UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	20
UEENEEM064A	Conduct audit of hazardous areas installations — coal mining	60

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UEENEEM065A	Conduct audit of hazardous areas installations — gas atmospheres	60
UEENEEM066A	Conduct audit of hazardous areas installations — dust atmospheres	60
UEENEEM067A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — coal mining	60
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — gas atmospheres	60
UEENEEM069A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — dust atmospheres	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 180 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE128A	Develop engineering solutions to photonic system problems	80
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80
UEENEEE162A	Select drive components for electrical equipment design	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEE164A	Design electrical machine drives and production layout plans	80
UEENEEE078B	Contribute to risk management in electrotechnology systems	20

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UEENEEH147A	Assess electronic apparatus compliance	60
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80
UEENEEH185A	Design signal-conditioning subsystems	80
UEENEEH188A	Design and develop electronics - computer systems projects	40
UEENEEI123A	Design electronic control systems	60
UEENEEI128A	Set up and configure controls on complex fluid systems	80
UEENEEI129A	Set up electronically controlled mechanically operated complex systems	80
UEENEEI130A	Set up electronically controlled robotically operated complex systems	80
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Interfacing	120
UEENEEM052A	Classify hazardous areas — gas atmospheres	40
UEENEEM053A	Classify hazardous areas — dust atmospheres	40
UEENEEM057A	Design explosion-protected electrical systems and installations — gas atmospheres	20
UEENEEM058A	Design explosion-protected electrical systems and installations — dust atmospheres	20
UEENEEM059A	Design explosion-protected electrical systems and installations — pressurisation	20
UEENEEM075A	Design explosion-protected electrical systems — Coal mining	20
UEENEEM079A	Design of gas detection systems	20

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.

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2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE61711 Advanced Diploma of Engineering Technology - Electronics

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
4	Add	Group B	UEENEEI150A – Develop, enter and verify discrete control programs for programmable controllers	60
4	Add	Group C	UEENEEI151A – Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
4	Add	Group C	UEENEEI152A – Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
4	Add	Group D	UEENEEI157A – Configure and maintain industrial control system networks	60
4	Add	Group E	UEENEEI154A – Design and use advanced programming tools PC networks and HMI Interfacing	120
5	Add	Group C	UEENEEK145A Implement and monitor energy sector environmental and sustainable energy policies and procedures	20
5	Move	Group C	Move to Group D UEENEEH189A Design electronic printed circuit boards	40
5	Edit	Core	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80
5	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes	20

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			and practices in the workplace	
5	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
5	Edit	Core	Correct title of UEENEEE125A - Provide engineering solutions for problems in complex multiple path circuits	60
5	Edit	Core	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
5	Edit	Core	Correct title of UEENEEH188A - Design and develop electronics - computer systems projects	40
5	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
5	Edit	Elective	Correct title of UEENEED110A - Set up, create and implement content for a web server	120
5	Edit	Elective	Correct title of UEENEED111A - Develop, implement and test object oriented code	140
5	Edit	Elective	Correct title of UEENEED112A - Support computer hardware and software for engineering applications	120
5	Edit	Elective	Correct title of UEENEED113A - Install and administer Unix based networked computers	80
5	Edit	Elective	Correct title of UEENEED115A - Administer computer networks	80
5	Edit	Elective	Correct title of UEENEED117A - Install and configure network systems for internetworking	120
5	Edit	Elective	Correct title of UEENEED118A - Design and implement network systems for internetworking	120
5	Edit	Elective	Correct title of UEENEED119A - Design and implement advanced routing for internetworking systems	100
5	Edit	Elective	Correct title of UEENEED120A - Design and implement remote access for Internetworking systems	100
5	Edit	Elective	Correct title of UEENEED121A - Design and implement multi-layer switching for Internetworking	100

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			systems	
5	Edit	Elective	Correct title of UEENEED122A - Design and implement security for Internetworking systems	100
5	Edit	Elective	Correct title of UEENEED123A - - Design and implement wireless LANs/WANs for internetworking systems	100
5	Edit	Elective	Correct title of UEENEED124A - Integrate multiple computer operating systems on a client server local area network	80
5	Edit	Elective	Correct title of UEENEED129A - Develop web pages for engineering applications	40
5	Edit	Elective	Correct title of UEENEED130A - Select, install, configure and test multimedia components	40
5	Edit	Elective	Correct title of UEENEED143A - Install and configure a client computer operating system and software	40
5	Edit	Elective	Correct title of UEENEED144A - Commission industrial computer systems	20
5	Edit	Elective	Correct title of UEENEED145A - Modify-redesign of industrial computer systems	20
5	Edit	Elective	Correct title of UEENEED150A - Develop industrial control programs for microcomputer equipped devices	60
5	Edit	Elective	Correct title of UEENEED151A - Provide programming solution for computer systems engineering problems	60
5	Edit	Elective	Correct title of UEENEED152A - Design embedded controller control systems	80
5	Edit	Elective	Correct title of UEENEED153A - Set up, configure and test biometric devices	40
5	Edit	Elective	Correct title of UEENEED154A - Analyse and implement biometric measuring techniques and applications	120
5	Edit	Elective	Correct title of UEENEED155A - Develop and validate biometric equipment/systems installation	120

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5	Edit	Elective	Correct title of UEENEEH174A - Troubleshoot audio - video recording equipment	120
5	Edit	Elective	Correct title of UEENEEH183A - Analyse the performance of wireless-based electronic - communication systems	40
5	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Description

Scope
This qualification provides competencies to design and validate/evaluate electronics and/or communication equipment and systems and provide technical advice/sales.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

All the Core competency standard units, defined in the Core Competency Standard Units table below and

A combination of Elective competency standard units to achieve a total weighting of 1000 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60

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UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH146A	Solve fundamental electronic communications system problems	40
UEENEEH188A	Design and develop electronics - computer systems projects	40
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1160**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 1000 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	360
B	**Qualification Elective Units**	0	200
C	**Qualification Elective Units**	0	200
D	**Qualification Elective Units**	100	300
E	**Qualification Elective Units** You may select all your elective units from this Group	280	1000

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 360		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
BSBINM501A	Manage an information or knowledge management system	50
BSBWOR502B	Ensure team effectiveness	60
BSBMGT502B	Manage people performance	70
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50

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	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 360 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 200		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA103A	Set up and check electronic component assembly machines	40
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA105A	Conduct quality and functional tests on assembled electronic apparatus	20
UEENEEA106A	Use lead-free soldering techniques	40
UEENEEB101A	Operate and maintain amateur radio communication stations	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEE122A	Carry out preparatory energy sector work activities	60
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20

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UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless communication networks	40
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEF111A	Test, report and rectify faults in data and voice installations	40
UEENEEF114A	Set up and configure basic data communication systems	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH104A	Set up and test residential video/audio equipment	40
UEENEEH105A	Verify functionality and compliance of custom electronic installations	40
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises	120
UEENEEH107A	Repair predictable faults in general electronic apparatus	40
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus	40

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UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus	120
UEENEEH118A	Fault find and repair electronic apparatus	40
UEENEEH119A	Repair predictable faults in television receivers	120
UEENEEH120A	Fault find and repair gaming and games equipment	80
UEENEEH122A	Fault find and repair remote control apparatus	60
UEENEEH123A	Fault find and repair microwave heating apparatus	40
UEENEEH124A	Repair predictable faults in audio components	40
UEENEEH138A	Fault find and repair complex power supplies	40
UEENEEH142A	Solve oscillator problems	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH171A	Troubleshoot faults in television receivers	120
UEENEEH172A	Troubleshoot communication systems	80
UEENEEH174A	Troubleshoot audio - video recording equipment	120
UEENEEH187A	Solve problems in electronic musical equipment circuits	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable energy policies and procedures	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 200	**Weighting Points**

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Group C – Qualification Elective Units You may complete units to a maximum weighting of 200		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED113A	Install and administer Unix based networked computers	80
UEENEED116A	Develop computer network services	120
UEENEED117A	Install and configure network systems for internetworking	120
UEENEED124A	Integrate multiple computer operating systems on a client server local area network	80
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEH133A	Fault find and repair telecommunication apparatus and systems	60
UEENEEH135A	Design custom electronic equipment installations	120
UEENEEH136A	Design commercial video/audio installations	120
UEENEEH157A	Develop basic plans for integrating security systems	40
UEENEEH175A	Troubleshooting in security system installations	60
UEENEEH176A	Diagnose and rectify faults in electronic display circuits	60
UEENEEH177A	Diagnose and rectify faults in recording and replay equipment	60
UEENEEH178A	Diagnose and rectify faults in camera circuits and equipment	60
UEENEEH179A	Diagnose and rectify faults in digital television circuits and apparatus	80
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory	60

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Group C – Qualification Elective Units You may complete units to a maximum weighting of 200		**Weighting Points**
	Control and Data Acquisition systems	
UEENEEI155A	Develop structured programs to control external devices	40

Group D – Qualification Elective Units You may complete units to a maximum weighting of 300		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEED110A	Set up, create and implement content for a web server	120
UEENEED111A	Develop, implement and test object oriented code	140
UEENEED115A	Administer computer networks	80
UEENEED144A	Commission industrial computer systems	20
UEENEED145A	Modify-redesign of industrial computer systems	20
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120
UEENEED155A	Develop and validate biometric equipment/systems installation	120
UEENEEE070B	Write specifications for computer systems engineering projects	40
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEH148A	Design and develop advanced digital systems	40
UEENEEH149A	Develop engineering solutions to audio electronic problems	60

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UEENEEH158A	Design integrated security systems	40
UEENEEH159A	Design integrated complex security systems for multiple sites	60
UEENEEH181A	Design electronic printed circuit boards	40
UEENEEH182A	Develop engineering solutions to RF amplifiers problems	40
UEENEEH183A	Analyse the performance of wireless-based electronic - communication systems	40
UEENEEH189A	Design electronic printed circuit boards	40
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 280 You may select all your elective units from this Group		**Weighting Points**
UEENEED114A	Design and manage enterprise computer networks	80
UEENEED118A	Design and implement network systems for internetworking	120
UEENEED119A	Design and implement advanced routing for internetworking systems	100
UEENEED120A	Design and implement remote access for Internetworking systems	100
UEENEED121A	Design and implement multi-layer switching for Internetworking systems	100
UEENEED122A	Design and implement security for Internetworking systems	100
UEENEED123A	Design and implement wireless LANs/WANs for internetworking systems	100
UEENEED150A	Develop industrial control programs for microcomputer equipped devices	60

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UEENEED151A	Provide programming solution for computer systems engineering problems	60
UEENEED152A	Design embedded controller control systems	80
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE128A	Develop engineering solutions to photonic system problems	80
UEENEEH147A	Assess electronic apparatus compliance	60
UEENEEH160A	Plan large electronic projects	60
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80
UEENEEH185A	Design signal-conditioning subsystems	80
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Interfacing	120

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE61811 Advanced Diploma of Engineering Technology - Computer Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
4	Add	Group C	UEENEEK145A Implement and monitor energy sector environmental and sustainable energy policies and procedures	20
4	Move	Group C	Move to Group D UEENEEH189A Design electronic printed circuit boards	40
4	Edit	Core	Correct title of UEENEED102A - Assemble, set-up and test computing devices	80
4	Edit	Core	Correct title of UEENEED112A - Support computer hardware and software for engineering applications	120
4	Edit	Core	Correct title of UEENEED117A - Install and configure network systems for internetworking	120
4	Edit	Core	Correct title of UEENEEE015B - Develop design briefs for electrotechnology projects	40
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE125A - Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Core	Correct title of UEENEEH188A - Design and develop electronics - computer systems projects	40

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4	Edit	Elective	Correct title of UEENEED118A - Design and implement network systems for internetworking	120
4	Edit	Elective	Correct title of UEENEED119A - Design and implement advanced routing for internetworking systems	100
4	Edit	Elective	Correct title of UEENEED120A - Design and implement remote access for Internetworking systems	100
4	Edit	Elective	Correct title of UEENEED121A - Design and implement multi-layer switching for Internetworking systems	100
4	Edit	Elective	Correct title of UEENEED122A - Design and implement security for Internetworking systems	100
4	Edit	Elective	Correct title of UEENEED123A - Design and implement wireless LANs/WANs for internetworking systems	100
4	Edit	Elective	Correct title of UEENEED148A - Plan industrial computer systems projects	60
4	Edit	Elective	Correct title of UEENEED150A - Develop industrial control programs for microcomputer equipped devices	60
4	Edit	Elective	Correct title of UEENEED151A - Provide programming solution for computer systems engineering problems	60
4	Edit	Elective	Correct title of UEENEED152A - Design embedded controller control systems	80
4	Edit	Elective	Correct title of UEENEEH183A - Analyse the performance of wireless-based electronic - communication systems	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20

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Description

Scope

This qualification provides enabling competencies to design, install/validate/evaluate and administer computer and network based systems and provide technical advice/sales.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 1000 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED102A	Assemble, set-up and test computing devices	80
UEENEED104A	Use engineering applications software on personal computers	40
UEENEED112A	Support computer hardware and software for engineering applications	120
UEENEED117A	Install and configure network systems for internetworking	120
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE038B	Participate in development and follow a personal competency development plan	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and	20

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	procedures	
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEH112A	Troubleshoot digital sub-systems	80
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus	80
UEENEEH188A	Design and develop electronics - computer systems projects	40
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1160**

Elective Competency Standard Units **Complete Elective units to achieve a total of weighting of 1000 points from the following groups:**			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	360
B	**Qualification Elective Units**	0	200
C	**Qualification Elective Units**	0	200
D	**Qualification Elective Units**	0	300

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Elective Competency Standard Units **Complete Elective units to achieve a total of weighting of 1000 points from the following groups:**			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	360
E	**Qualification Elective Units** You may select all your elective units from this Group	280	1000

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 360		**Weighting Points**
BSBINM501A	Manage an information or knowledge management system	50
BSBINN502A	Build and sustain an innovative work environment	50
BSBMGT502B	Manage people performance	70
BSBMGT516C	Facilitate continuous improvement	60
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE020B	Provide basic instruction in the use of	20

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	electrotechnology apparatus	
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 360 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 200		**Weighting Points**
UEENEEA101A	Assemble electronic components	40
UEENEEA102A	Select electronic components for assembly	20
UEENEEA104A	Modify electronic sub assemblies	40
UEENEEA106A	Use lead-free soldering techniques	40
UEENEED129A	Develop web pages for engineering applications	40
UEENEED130A	Select, install, configure and test multimedia components	40
UEENEED143A	Install and configure a client computer operating system and software	40
UEENEED146A	Set up and configure basic local area network (LAN)	80
UEENEED153A	Set up, configure and test biometric devices	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE123A	Solve basic problems electronic and digital equipment and circuits	80
UEENEEE179A	Identify and select components, accessories and materials for energy sector work activities	20
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEF105A	Install and modify optical fibre performance data communication cabling	40
UEENEEF107A	Set up and configure the wireless capabilities of communications and data storage devices	40
UEENEEF108A	Select and arrange equipment for wireless	40

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	communication networks	
UEENEEF109A	Install and connect data and voice communication equipment	40
UEENEEF110A	Select and arrange data and voice equipment for local area networks	40
UEENEEH101A	Repair basic computer equipment faults by replacement of modules/sub-assemblies	40
UEENEEH103A	Repair routine business equipment faults	120
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus	80
UEENEEH115A	Develop software solutions for microcontroller based systems	60
UEENEEH118A	Fault find and repair electronic apparatus	40
UEENEEH139A	Troubleshoot basic amplifier circuits	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEH151A	Install large security systems	100
UEENEEH152A	Enter instructions and test wired and wireless security systems	40
UEENEEH166A	Troubleshoot microcontroller based hardware systems	40
UEENEEH169A	Solve problems in basic electronic circuits	100
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 200		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEED103A	Evaluate and modify object oriented code programs	40

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UEENEED113A	Install and administer Unix based networked computers	80
UEENEED115A	Administer computer networks	80
UEENEED124A	Integrate multiple computer operating systems on a client server local area network	80
UEENEED154A	Analyse and implement biometric measuring techniques and applications	120
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable energy policies and procedures	20

Group D – Qualification Elective Units You may complete units to a maximum weighting of 300		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEED110A	Set up, create and implement content for a web server	120
UEENEED111A	Develop, implement and test object oriented code	140
UEENEED116A	Develop computer network services	120
UEENEED155A	Develop and validate biometric equipment/systems installation	120
UEENEEE070B	Write specifications for computer systems engineering projects	40
UEENEED147A	Develop energy sector directory services	80
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80
UEENEEH145A	Develop engineering solutions to analogue electronic problems	80
UEENEEH181A	Design electronic printed circuit boards	40
UEENEEH183A	Analyse the performance of wireless-based electronic -	40

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	communication systems	
UEENEEH189A	Design electronic printed circuit boards	40

Group E – Qualification Elective Units You must complete units to a minimum weighting of 280 You may select all your elective units from this Group		**Weighting Points**
UEENEED114A	Design and manage enterprise computer networks	80
UEENEED118A	Design and implement network systems for internetworking	120
UEENEED119A	Design and implement advanced routing for internetworking systems	100
UEENEED120A	Design and implement remote access for Internetworking systems	100
UEENEED121A	Design and implement multi-layer switching for Internetworking systems	100
UEENEED122A	Design and implement security for Internetworking systems	100
UEENEED123A	Design and implement wireless LANs/WANs for internetworking systems	100
UEENEED148A	Plan industrial computer systems projects	60
UEENEED150A	Develop industrial control programs for microcomputer equipped devices	60
UEENEED151A	Provide programming solution for computer systems engineering problems	60
UEENEED152A	Design embedded controller control systems	80
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE128A	Develop engineering solutions to photonic system problems	80
UEENEED149A	Develop energy sector computer network applications infrastructure	80

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UEENEEH147A	Assess electronic apparatus compliance	60
UEENEEH148A	Design and develop advanced digital systems	40
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80
UEENEEH185A	Design signal-conditioning subsystems	80

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE62011 Advanced Diploma of Engineering Technology - Renewable Energy

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
4	Edit	Core	Correct title of UEENEEE080A - Apply industry and community standards to engineering activities	20
4	Edit	Core	Correct title of UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
4	Edit	Core	Correct title of UEENEEE102A - Fabricate, assemble and dismantle utilities industry components	40
4	Edit	Core	Correct title of UEENEEE108A - Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
4	Edit	Core	Correct title of UEENEEE125A - Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Core	Correct title of UEENEEK128A - Solve problems in stand-alone renewable energy systems	60
4	Edit	Elective	Correct title of UEENEEC004B - Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
4	Edit	Elective	Correct title of UEENEEE114A - Supervise and	40

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			coordinate energy sector work activities	
4	Edit	Elective	Correct title of UEENEEE192A - Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
4	Edit	Elective	Correct title of UEENEEK110A - Co-ordinate maintenance of renewable energy (RE) apparatus and systems	20
4	Edit	Elective	Correct title of UEENEEK117A - Maintain and repair facilities associated with remote area essential service operations	120
4	Edit	Elective	Correct title of UEENEEK130A - Solve problems in wind energy conversion systems rated up to 10 kW	60
4	Edit	Elective	Correct title of UEENEEK131A - Design wind energy conversion systems (WECS) rated to 10 kW	60
4	Edit	Elective	Correct title of UEENEEK134A - Install ELV stand-alone photovoltaic power systems	60
4	Edit	Elective	Correct title of UEENEEK135A - Design grid connected photovoltaic power supply systems	60
4	Edit	Elective	Correct title of UEENEEK138A - Design micro-hydro systems rated to 6.4 kW	60
4	Edit	Elective	Correct title of UEENEEK139A - Design stand-alone renewable energy (RE) systems	40
4	Edit	Elective	Correct title of UEENEEK140A - Develop engineering solutions to renewable energy (RE) problems	60
4	Edit	Elective	Correct title of UEENEEK143A - Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
4	Edit	Elective	Correct title of UEENEEK146A - Design energy management controls for electrical installations in buildings	80
4	Edit	Elective	Correct title of UEENEEK149A - Verify compliance and functionality of a extra low voltage renewable energy installation	40
4	Edit	Elective	Correct title of UEENEEK151A - Develop effective	60

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			engineering strategies for energy reduction in buildings	
4	Edit	Elective	Correct title of UEENEEP026A - Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	60

Description

Scope
This qualification provides competencies in preparation to design and validate/evaluate renewable energy equipment and systems and provide technical advice/sales.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 900 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE074B	Write specifications for renewable energy engineering projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits	40
UEENEEE117A	Implement and monitor energy sector OHS policies and	20

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	procedures	
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEK121A	Manage renewable energy (RE) projects	40
UEENEEK122A	Plan renewable energy (RE) projects	60
UEENEEK123A	Carry out basic repairs to renewable energy apparatus	80
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK127A	Diagnose and rectify faults in renewable energy control systems	60
UEENEEK128A	Solve problems in stand-alone renewable energy systems	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1260**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 900 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	360
B	**Qualification Elective Units**	0	240
C	**Qualification Elective Units**	0	220
D	**Qualification Elective Units**	0	220
E	**Qualification Elective Units** You may select all your elective units from this Group	280	320

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 360		**Weighting Points**
BSBINM501A	Manage an information or knowledge management system	50
BSBINN502A	Build and sustain an innovative work environment	50
BSBMGT502B	Manage people performance	70
BSBMGT516C	Facilitate continuous improvement	60
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20

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	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 360 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 240		**Weighting Points**
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK107A	Conduct checks in the demand side use of remote area power supplies (RAPS)	40
UEENEEK108A	Plan periodic maintenance schedules of remote area power supplies (RAPS)	40
UEENEEK109A	Attend to breakdowns in remote area power supplies (RAPS)	20
UEENEEK117A	Maintain and repair facilities associated with remote area essential service operations	120
UEENEEK120A	Maintain operation of remote area power generation plant	120
UEENEEK124A	Solve basic problems in micro hydro systems	20
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW	60
UEENEEK134A	Install ELV stand-alone photovoltaic power systems	60
UEENEEK137A	Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW	20
UEENEEK143A	Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications	20
UEENEEK149A	Verify compliance and functionality of a extra low voltage renewable energy installation	40
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment	20

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	for connection to 1000 Va.c. or 1500 Vd.c. supply	
UEENEEP026A	Conduct in-service safety testing of electrical cord connected equipment and cord assemblies	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects	40
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE114A	Supervise and coordinate energy sector work activities	40
UEENEEE192A	Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEK110A	Coordinate maintenance of renewable energy (RE) apparatus and systems	20
UEENEEK135A	Design grid connected photovoltaic power supply systems	60

Group D – Qualification Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEK129A	Design renewable energy (RE) heating systems	120
UEENEEK131A	Design wind energy conversion systems (WECS) rated to 10 kW	60
UEENEEK138A	Design micro-hydro systems rated to 6.4 kW	60

Group E – Qualification Elective Units	**Weighting**

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You must complete units to a minimum weighting of 280 to a maximum of 320		**Points**
UEENEEK133A	Design hybrid renewable power systems	80
UEENEEK139A	Design stand-alone renewable energy (RE) systems	40
UEENEEK140A	Develop engineering solutions to renewable energy (RE) problems	60
UEENEEK146A	Design energy management controls for electrical installations in buildings	80
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	60

Note:
1. Prerequisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a prerequisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE62111 Advanced Diploma of Engineering Technology - Electrical

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	
2	Edit		Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	
2	Edit		Edit Name to reflect correct Unit title UEENEEI154A Design and use advanced programming tools PC networks and HMI Interfacing	
2	Edit		Edit Name to reflect correct Unit title UEENEEG145A Develop engineering solutions for induction machine and control problems	
2	Edit		Edit Name to reflect correct Unit title UEENEEE117A Implement and monitor energy sector OHS policies and procedures	
2	Edit		Edit Name to reflect correct Unit title UEENEEE124A Compile and produce an energy sector detailed report	
2	Edit		Edit Name to reflect correct Unit title UEENEEK132A Develop strategies to address environmental and sustainability issues in the energy sector	

3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60

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4	Edit	Core	Correct title of UEENEEE125A - Provide engineering solutions for problems in complex multiple path circuits	60
4	Edit	Elective	Correct title of UEENEED101A - Use computer applications relevant to a workplace	20
4	Edit	Elective	Correct title of UEENEEE121A - Plan an integrated cabling installation system	40
4	Edit	Elective	Correct title of UEENEEE127A Use advanced computational processes to provide solutions to energy sector engineering problems	80
4	Edit	Elective	Correct title of UEENEEE128A Develop engineering solutions to photonic system problems	80
4	Edit	Elective	Correct title of UEENEEE161A Analyse static and dynamic parameters of electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE162A Select drive components for electrical equipment design	80
4	Edit	Elective	Correct title of UEENEEE163A Analyse materials for suitability in electrical equipment	80
4	Edit	Elective	Correct title of UEENEEG111A Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of UEENEEG120A Select and arrange equipment for special LV electrical installations	60
4	Edit	Elective	Correct title of UEENEEG125A Plan electrical installations with a low voltage demand up to 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG127A Design electrical installations with a low voltage demand greater than 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG128A Plan low voltage switchboard and control panel layouts	40
4	Edit	Elective	Correct title of UEENEEG130A Design switchboards rated for high fault levels (greater than 400 A)	60

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4	Edit	Elective	Correct title of UEENEEG131A Evaluate performance of low voltage electrical apparatus	40
4	Edit	Elective	Correct title of UEENEEG143A Develop engineering solution for synchronous machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG144A Develop engineering solutions for d.c. machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG161A Design and develop modifications to LV electrical machines	60
4	Edit	Elective	Correct title of UEENEEG185A Select effective and efficient light sources and luminaries for given locations and designs	60
4	Edit	Elective	Correct title of UEENEEH102A Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEH147A Assess electronic apparatus compliance	60
4	Edit	Elective	Correct title of UEENEEH150A Assemble and set up basic security systems	80
4	Edit	Elective	Correct title of UEENEEH184A Modify digital signal processing (DSP) based sub-systems	80
4	Edit	Elective	Correct title of UEENEEH185A Design signal-conditioning subsystems	80
4	Edit	Elective	Correct title of UEENEEH188A Design and develop electronics - computer systems projects	40
4	Edit	Elective	Correct title of UEENEEI101A Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI116A Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI123A Design electronic control systems	60
4	Edit	Elective	Correct title of UEENEEI128A Set up and	80

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			configure controls on complex fluid systems	
4	Edit	Elective	Correct title of UEENEEK131A Design wind energy conversion systems (WECS) rated to 10 kW	60
4	Edit	Elective	Correct title of UEENEEK135A Design grid connected photovoltaic power supply systems	60
4	Edit	Elective	Correct title of UEENEEK138A Design micro-hydro systems rated to 6.4 kW	60
4	Edit	Elective	Correct title of UEENEEK139A Design stand-alone renewable energy (RE) systems	40
4	Edit	Elective	Correct title of UEENEEK140A Develop engineering solutions to renewable energy (RE) problems	60
4	Edit	Elective	Correct title of UEENEEK146A Design energy management controls for electrical installations in buildings	80
4	Edit	Elective	Correct title of UEENEEK151A Develop effective engineering strategies for energy reduction in buildings	60
4	Edit	Elective	Correct title of UEENEEM079A Design of gas detection systems	20

Description

Scope

This qualification provides enabling competencies to design and validate/evaluate electrical equipment and systems and provide technical advice/sales.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

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Entry Requirements

Not applicable.

Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 720 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE071B	Write specifications for electrical engineering projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20

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UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEG169A	Manage large electrical projects	40
UEENEEG170A	Plan large electrical projects	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1440**

Elective Competency Standard Units

Complete Elective units to achieve a total of weighting of 720 points from the following groups:

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Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	360
B	**Qualification Elective Units**	0	160
C	**Qualification Elective Units**	0	220
D	**Qualification Elective Units**	0	220
E	**Qualification Elective Units** You may select all your elective units from this Group	200	720

Group A – Imported and Common Elective Units You may complete units to a maximum weighting of 360		**Weighting Points**
BSBINM501A	Manage an information or knowledge management system	50
BSBINN502A	Build and sustain an innovative work environment	50
BSBMGT502B	Manage people performance	70
BSBMGT516C	Facilitate continuous improvement	60
BSBWOR502B	Ensure team effectiveness	60
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20

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UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 360 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 160		**Weighting Points**
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications	60
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	60
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG120A	Select and arrange equipment for special LV electrical installations	60
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20

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UEENEEI138A	Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	60
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40

Group C – Qualification Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEG184A	Provide photometric data for illumination system design	60
UEENEEG185A	Select effective and efficient light sources and luminaries for given locations and designs	60
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings	20
UEENEEG188A	Prepare quotations for the supply of effective and efficient lighting products for lighting projects	20
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen	20
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20

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UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEK135A	Design grid connected photovoltaic power supply systems	60

Group D – Qualification Elective Units You may complete units to a maximum weighting of 220		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEED147A	Develop energy sector directory services	80
UEENEEG127A	Design electrical installations with a low voltage demand greater than 400 A per phase	40
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEG187A	Design effective and efficient lighting for public, open and sports areas	20
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEK129A	Design renewable energy (RE) heating systems	120

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UEENEEK131A	Design wind energy conversion systems (WECS) rated to 10 kW	60
UEENEEK138A	Design micro-hydro power systems	60
UETTDRIS70A	Diagnose and rectify faults in electrical energy distribution systems	60
UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission systems	60
UETTDRIS72A	Diagnose and rectify faults in distributed Generation systems	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 200 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEE078B	Contribute to risk management in electrotechnology systems	20
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE128A	Develop engineering solutions to photonic system problems	80
UEENEED149A	Develop energy sector computer network applications infrastructure	80
UEENEEE160A	Provide engineering solutions for uses of materials and thermodynamic effects	80
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80
UEENEEE162A	Select drive components for electrical equipment design	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEE164A	Design electrical machine drives and production layout plans	80
UEENEEG130A	Design switchboards rated for high fault levels (greater	60

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	than 400 A)	
UEENEEG143A	Develop engineering solution for synchronous machine and control problems	60
UEENEEG144A	Develop engineering solutions for d.c. machine and control problems	60
UEENEEG145A	Develop engineering solutions for induction machine and control problems	60
UEENEEG160A	Evaluate performance of LV electrical machines	40
UEENEEG161A	Design and develop modifications to LV electrical machines	60
UEENEEH147A	Assess electronic apparatus compliance	60
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80
UEENEEH185A	Design signal-conditioning subsystems	80
UEENEEH188A	Design and develop electronics - computer systems projects	40
UEENEEI123A	Design electronic control systems	60
UEENEEI128A	Set up and configure controls on complex fluid systems	80
UEENEEI129A	Set up electronically controlled mechanically operated complex systems	80
UEENEEI130A	Set up electronically controlled robotically operated complex systems	80
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Interfacing	120
UEENEEK133A	Design hybrid renewable power systems	80
UEENEEK139A	Design stand-alone renewable energy (RE) systems	40
UEENEEK140A	Develop engineering solutions to renewable energy (RE) problems	60
UEENEEK146A	Design energy management controls for electrical	80

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	installations in buildings	
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	60
UEENEEM052A	Classify hazardous areas — gas atmospheres	40
UEENEEM053A	Classify hazardous areas — dust atmospheres	40
UEENEEM057A	Design explosion-protected electrical systems and installations — gas atmospheres	20
UEENEEM058A	Design explosion-protected electrical systems and installations — dust atmospheres	20
UEENEEM059A	Design explosion-protected electrical systems and installations — pressurisation	20
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — gas atmospheres	60
UEENEEM075A	Design explosion-protected electrical systems — Coal mining	20
UEENEEM079A	Design of gas detection systems	20
UETTDRIS73A	Develop engineering solutions for energy supply power transformer problems	60
UETTDRIS74A	Develop engineering solutions for energy supply system protection problems	60

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEE62211 Advanced Diploma of Electrical - Engineering

Modification History

Release	Action	Core/Elective	Details	Points
3	Add	Group B	UETTDRIS44A Perform HV field switching operation to a given schedule	60
3	Add	Group D	UETTDRIS69A Diagnose and rectify faults in energy supply apparatus	60
3	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
3	Edit		Edit Name to reflect correct Unit title UEENEEE117A Implement and monitor energy sector OHS policies and procedures	
3	Edit		Edit Name to reflect correct Unit title UEENEEE124A Compile and produce an energy sector detailed report	
3	Edit		Edit Name to reflect correct Unit title UEENEEK132A Develop strategies to address environmental and sustainability issues in the energy sector	
3	Edit		Move unit from Elective Group C to Group B UETTDRIS67A Solve problems in energy supply network equipment	
3	Edit		Move unit from Elective Group C to Group B UETTDRIS68A Solve problems in energy supply network protection equipment and systems	

4	Edit	Group B	Edit Name to reflect correct Unit title	40

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			UEENEEI102A Solve problems in pressure measurement components and systems	
4	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
4	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
4	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
4	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60

5	Edit	Elective	Correct title of UEENEEE121A - Plan an integrated cabling installation system	40
5	Edit	Elective	Correct title of UEENEEG110A - Find and repair faults in LV d.c. electrical apparatus and circuits	60
5	Edit	Elective	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40
5	Edit	Elective	Correct title of UEENEEG113A - Install and maintain emergency safety systems	60
5	Edit	Elective	Correct title of UEENEEG116A - Diagnose and rectify faults in traction lift systems	80
5	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
5	Edit	Elective	Correct title of UEENEEG120A - Select and arrange equipment for special LV electrical installations	60
5	Edit	Elective	Correct title of UEENEEG125A - Plan electrical installations with a low voltage demand up to 400 A per phase	40
5	Edit	Elective	Correct title of UEENEEG126A - Install and	40

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			maintain field power and distribution systems with a low voltage demand up to 200 A per phase	
5	Edit	Elective	Correct title of UEENEEG129A - Overhaul and repair major switchgear and controlgear	60
5	Edit	Elective	Correct title of UEENEEG132A - Carry out low voltage electrical field testing and report findings	60
5	Edit	Elective	Correct title of UEENEEG153A - Rewind three phase low voltage induction machines	60
5	Edit	Elective	Correct title of UEENEEG155A - Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
5	Edit	Elective	Correct title of UEENEEG156A - Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
5	Edit	Elective	Correct title of UEENEEG159A - Conduct mechanical tests on electrical machines and components	40
5	Edit	Elective	Correct title of UEENEEG164A - Repair and maintain mechanical components of electrical machines	40
5	Edit	Elective	Correct title of UEENEEG165A - Maintain and service traction lifts systems and equipment	40
5	Edit	Elective	Correct title of UEENEEG166A - Install and maintain escalators, moving walks and treadways	40
5	Edit	Elective	Correct title of UEENEEG167A - Align and install traction lift equipment	20
5	Edit	Elective	Correct title of UEENEEG168A - Diagnose and rectify faults in complex lift systems	40
5	Edit	Elective	Correct title of UEENEEG172A - Investigate and report on electrical incidents and causes	60
5	Edit	Elective	Correct title of UEENEEG177A - Select low voltage power factor correction equipment	40
5	Edit	Elective	Correct title of UEENEEG185A - Select effective and efficient light sources and luminaries for given locations and designs	60

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5	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
5	Edit	Elective	Correct title of UEENEEH150A - Assemble and set up basic security systems	80
5	Edit	Elective	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
5	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
5	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
5	Edit	Elective	Correct title of UEENEEI119A - Set up industrial field control devices	60
5	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
5	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60
5	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60
5	Edit	Elective	Correct title of UEENEEK135A - Design grid connected photovoltaic power supply systems	60
5	Edit	Elective	Correct title of UEENEEK142A - Apply environmentally and sustainable procedures in the energy sector	20
5	Edit	Elective	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20
5	Edit	Elective	Correct title of UEENEEK148A - Install, configure and commission LV grid connected photovoltaic power systems	40
5	Edit	Elective	Correct title of UEENEEK153A - Assess energy loads and uses for energy efficiency in residential, office and retail premises	40

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5	Edit	Elective	Correct title of UEENEEK154A - Assess energy loads and uses for energy efficiency in commercial facilities	40
5	Edit	Elective	Correct title of UEENEEK155A - Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40
5	Edit	Elective	Correct title of UEENEEM039A - Conduct testing of hazardous areas installations - gas atmospheres	40
5	Edit	Elective	Correct title of UEENEEM044A - Conduct detailed inspection of hazardous areas installations - gas atmospheres	40
5	Edit	Elective	Correct title of UEENEEM080A - Report on the integrity of explosion-protected equipment in a hazardous area	20

Description

Scope

This qualification provides competencies to design and validate/evaluate electrical equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales. It develops competencies in the ethical and responsible application of mathematics, science, engineering techniques, Standards and Codes of Practice, engineering design practices, supervision and management of physical, human and financial resources in engineering.

The core competencies of this qualification meet the prescribed requirements for Engineering Associate membership of Engineers Australia and ERAC requirements for an ‘Electrician’s licence’.

Participants seeking Engineers Australia membership should ensure that their training provider is accredited by that body to provide Engineering Education Programs at the level of Engineering Associate.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

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Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 480 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE006B	Apply methods to maintain currency of industry developments	20
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE071B	Write specifications for electrical engineering projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80

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UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations	40
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40

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UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEG169A	Manage large electrical projects	40
UEENEEG170A	Plan large electrical projects	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1680**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 480 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	220
B	**Qualification Elective Units**	0	60
C	**Qualification Elective Units**	0	100
D	**Qualification Elective Units**	0	60
E	**Qualification Elective Units** You may select the majority of your elective units from this Group	260	480

Group A – Imported and Common Electives Units You may complete units to a maximum weighting of 220		**Weighting Points**
BSBMGT502B	Manage people performance	70

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BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 220 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40
UEENEEA112A	Fabricate and assemble bus bars	40
UEENEEA113A	Mount and wire control panel equipment	40
UEENEEE121A	Plan an integrated cabling installation system	40
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services	120
UEENEEF104A	Install and modify performance data communication copper cabling	40
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG113A	Install and maintain emergency safety systems	60
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG120A	Select and arrange equipment for special LV electrical installations	60
UEENEEG126A	Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase	40
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEG150A	Wind electrical coils	40
UEENEEG151A	Place and connect electrical coils	40
UEENEEG152A	Rewind single phase machines	40

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UEENEEG153A	Rewind three phase low voltage induction machines	60
UEENEEG154A	Rewind LV direct current machines	60
UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40
UEENEEG165A	Maintain and service traction lifts systems and equipment	40
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40
UEENEEG167A	Align and install traction lift equipment	20
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEG189A	Install and maintain emergency lighting systems	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and	40

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	systems	
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI138A	Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	60
UEENEEI140A	Plan the electrical installation of integrated systems	20
UEENEEI141A	Develop electrical integrated systems	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems	20
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20
UEENEEK148A	Install, configure and commission LV grid connected photovoltaic power systems	40
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60

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UEENEEM024A	Install explosion-protected equipment and wiring systems — gas atmospheres	60
UEENEEM025A	Install explosion-protected equipment and wiring systems — dust atmospheres	60
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40
UETTDRIS44A	Perform HV field switching operation to a given schedule	40

Group C – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEG076A	Install and replace low voltage current transformer metering	20
UEENEEG121A	Verify compliance and functionality of special LV	40

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	electrical installations	
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40
UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60
UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
UEENEEG156A	Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
UEENEEG158A	Conduct electrical tests on HV electrical machines	60
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEG172A	Investigate and report on electrical incidents and causes	60
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80
UEENEEG177A	Select low voltage power factor correction equipment	40
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEG184A	Provide photometric data for illumination system design	60
UEENEEG185A	Select effective and efficient light sources and luminaries for given locations and designs	60
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings	20

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UEENEEG188A	Prepare quotations for the supply of effective and efficient lighting products for lighting projects	20
UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen	20
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20
UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEK135A	Design grid connected photovoltaic power supply systems	60
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20
UEENEEK152A	Develop strategies to address sustainability issues for	20

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	electrical installations	
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises	40
UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities	40
UEENEEK155A	Assess energy loads and uses for energy efficiency in industrial properties and enterprises	40
UEENEEM039A	Conduct testing of hazardous areas installations - gas atmospheres	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations - gas atmospheres	40
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	20
UEENEEM078A	Manage compliance of hazardous areas	20

Group D – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEED147A	Develop energy sector directory services	80
UEENEEG127A	Design electrical installations with a low voltage demand greater than 400 A per phase	40
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG160A	Evaluate performance of LV electrical machines	40
UEENEEI127A	Analyse complex electronic circuits controlling fluids	80
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	60
UEENEEM036A	Conduct a conformity assessment of explosion-protected	40

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	equipment — gas atmospheres	
UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	20
UEENEEM065A	Conduct audit of hazardous areas installations — gas atmospheres	60
UETTDRIS70A	Diagnose and rectify faults in electrical energy distribution systems	60
UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission systems	60
UETTDRIS72A	Diagnose and rectify faults in distributed Generation systems	60
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 260 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEED150A	Develop industrial control programs for microcomputer equipped devices	60
UEENEED151A	Provide programming solution for computer systems engineering problems	60
UEENEED152A	Design embedded controller control systems	80
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEED149A	Develop energy sector computer network applications infrastructure	80
UEENEEG130A	Design switchboards rated for high fault levels (greater than 400 A)	60
UEENEEG145A	Develop engineering solutions for induction machine and control problems	60
UEENEEG161A	Design and develop modifications to LV electrical machines	60

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UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI154A	Design and use advanced programming tools PC networks and HMI interfacing	120
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEM052A	Classify hazardous areas — gas atmospheres	40
UEENEEM057A	Design explosion-protected electrical systems and installations — gas atmospheres	20
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — gas atmospheres	60
UETTDRIS73A	Develop engineering solutions for energy supply power transformer problems	60
UETTDRIS74A	Develop engineering solutions for energy supply system protection problems	60

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.

END OF QUALIFICATION

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UEE62311 Advanced Diploma of Electrical Engineering - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
3	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
3	Edit		Move unit from Elective Group C to Group B UETTDRIS67A Solve problems in energy supply network equipment	
3	Edit		Move unit from Elective Group C to Group B UETTDRIS68A Solve problems in energy supply network protection equipment and systems	
4	Edit	Group D	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
5	Update	Elective	RIIRAI609D - Establish and maintain electrical installations, reticulation and protection system	120
5	Update	Elective	RIIRIS601D - Establish and maintain the risk management system	100
5	Edit	Core	Correct title of RIIRAI609A - Establish and maintain electrical installations, reticulation and protection system	120
5	Edit	Elective	Correct title of UEENEEI154A - Design and use advanced programming tools PC networks and HMI Interfacing	120

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5	Edit	Elective	Correct title of UEENEEM038A - Conduct testing of hazardous areas installations - coal mining	40
5	Edit	Elective	Correct title of UEENEEM043A - Conduct detailed inspection of hazardous areas installations - coal mining	40
5	Edit	Elective	Correct title of UEENEEM074A - Plan electrical installations in hazardous areas - Coal mining	20
5	Edit	Elective	Correct title of UEENEEM080A - Report on the integrity of explosion-protected equipment in a hazardous area	20

Description

Scope

This qualification provides competencies to design and validate/evaluate coal mining electrical equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales.

It develops competencies in the ethical and responsible application of mathematics, science, engineering techniques, Standards and Codes of Practice, engineering design practices, supervision and management of physical, human and financial resources in engineering.

The core competencies of this qualification meet\ the prescribed requirements for Engineering Associate membership of Engineers Australia and ERAC requirements for an ‘Electrician’s licence’.

Participants seeking Engineers Australia membership should ensure that their training provider is accredited by that body to provide Engineering Education Programs at the level of Engineering Associate.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

Entry Requirements

Not Applicable

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Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 320 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG105A - Those holding an 'Unrestricted Electricians Licence or equivalent issued in an Australian State or Territory meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
RIIRAI609D	Establish and maintain electrical installations, reticulation and protection system	120
RIIRIS601D	Establish and maintain the risk management system	100
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE006B	Apply methods to maintain currency of industry developments	20
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE071B	Write specifications for electrical engineering projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	60
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG103A	Install low voltage wiring and accessories	20
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations	20
UEENEEG105A	Verify compliance and functionality of low voltage	40

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
	general electrical installations	
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60
UEENEEG169A	Manage large electrical projects	40
UEENEEG170A	Plan large electrical projects	60
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1840**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 320 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	160
B	**Qualification Elective Units**	0	60

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C	**Qualification Elective Units**	0	100
D	**Qualification Elective Units**	0	60
E	**Qualification Elective Units** You may select the majority of your elective units from this Group	160	320

Group A – Imported and Common Electives Units You may complete units to a maximum weighting of 160		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 160 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM023A	Install explosion-protected equipment and wiring systems — coal mining	60
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM031A	Overhaul and repair of explosion-protected equipment — coal mining	60
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20

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Group C – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEG121A	Verify compliance and functionality of special LV electrical installations	40
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations	60
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	40
UEENEEG124A	Conduct compliance inspection of special LV electrical installations	60
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG158A	Conduct electrical tests on HV electrical machines	60
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEM038A	Conduct testing of hazardous areas installations - coal mining	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40

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UEENEEM043A	Conduct detailed inspection of hazardous areas installations - coal mining	40
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	20
UEENEEM078A	Manage compliance of hazardous areas	20
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems	40

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Group D – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEG127A	Design electrical installations with a low voltage demand greater than 400 A per phase	40
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG132A	Carry out low voltage electrical field testing and report findings	60
UEENEEG160A	Evaluate performance of LV electrical machines	40
UEENEEG172A	Investigate and report on electrical incidents and causes	60
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment — gas atmospheres	40
UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment — coal mining	40
UEENEEM064A	Conduct audit of hazardous areas installations — coal mining	60
UEENEEM074A	Plan electrical installations in hazardous areas - Coal mining	20

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Group E – Qualification Elective Units You must complete units to a minimum weighting of 160 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEG130A	Design switchboards rated for high fault levels (greater than 400 A)	60
UEENEEG145A	Develop engineering solutions for induction machine and control problems	60
UEENEEG161A	Design and develop modifications to LV electrical machines	60
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Interfacing	120
UEENEEM067A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — coal mining	60
UETTDRIS73A	Develop engineering solutions for energy supply power transformer problems	60

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.

END OF QUALIFICATION

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UEE62411 Advanced Diploma of Engineering Technology - Air-conditioning and Refrigeration

Modification History

Release	Action	Core/Elective	Details	Points
3	Add	Group A	CPPBDN5013A Develop and collaborate on building information models for small-scale building design projects	100
3	Add	Group D	UEENEEE150A Undertake computations in an energy sector environment	120
3	Add	Group D	UEENEEE129A Solve electrotechnical engineering problems	60
3	Add	Group D	UEENEEK151A Develop effective engineering strategies for energy reduction in buildings	60
3	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
5	Edit	Core	Correct title of UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications	80
5	Edit	Elective	Correct title of UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures	20

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Description

Scope

This qualification provides competencies to design and validate/evaluate refrigeration and air conditioning equipment and systems and provide technical advice/sales.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 800 points in accordance with the Elective Competency Standard Units table below.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE129A	Solve electrotechnical engineering problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEE146A	Identify effects of energy on machinery and materials in an energy sector environment	120

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEJ069B	Plan refrigeration and air conditioning projects	60
UEENEEJ127A	Establish the thermodynamic parameters of refrigeration and air conditioning systems	80
UEENEEJ128A	Produce HVAC/R system design drawings	80
UEENEEJ129A	Establish heat loads for commercial refrigeration and/or air conditioning applications	80
UEENEEJ138A	Analyse vibration and noise in refrigeration and air conditioning systems	80
UEENEEJ164A	Analyse the operation of HVAC air and hydronic systems	80
UEENEEJ165A	Evaluate thermodynamic and fluid parameters of refrigeration systems	100
UEENEEJ192A	Analyse the psychrometric performance of HVAC/R systems	50
UEENEEJ193A	Analyse the thermodynamic performance of HVAC/R systems	50
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1360**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 800 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz	0	350

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	Industry Technical Advisory Committee, their weighting will be 10 points.		
B	**Qualification Elective Units**	0	100
C	**Qualification Elective Units**	120	320
D	**Qualification Elective Units**	200	360
E	**Qualification Elective Units**	360	480

Group A – Imported and Common Electives Units You may complete units to a maximum weighting of 350		**Weighting Points**
UEENEEC001B	Maintain documentation	20
UEENEEC002B	Source and purchase material/parts for installation or service jobs	20
UEENEEC003B	Provide quotations for installation or service jobs	20
UEENEEC010B	Deliver a service to customers	20
UEENEED101A	Use computer applications relevant to a workplace	20
UEENEEE020B	Provide basic instruction in the use of electrotechnology apparatus	20
BSBINM501A	Manage an information or knowledge management system	50
BSBINN502A	Build and sustain an innovative work environment	50
CPPBDN5013A	Develop and collaborate on building information models for small-scale building design projects	100
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1	Up to 350 points

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	Qualification Framework	

Group B – Qualification Elective Units You may complete units to a maximum weighting of 100		**Weighting Points**
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant	10
UEENEEJ184A	Apply safety awareness and legal requirements for Carbon Dioxide refrigerant	10

Group C – Qualification Elective Units You must complete units to a minimum weighting of 120 to a maximum of 320		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEJ130A	Produce HVAC/R control system diagrams	40
UEENEEJ190A	Select basic commercial refrigeration system equipment, components and accessories	40
UEENEEJ191A	Select residential air conditioning system equipment, components and accessories	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20

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Group D – Qualification Elective Units You must complete units to a minimum weighting of 200 to a maximum of 360		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE150A	Undertake computations in an energy sector environment	120
UEENEEJ132A	Design commercial refrigeration systems and select components	80
UEENEEJ133A	Design industrial refrigeration systems and select components	60
UEENEEJ134A	Design heating, ventilation and air conditioning (HVAC) systems and select components	60
UEENEEJ135A	Design control systems for refrigeration or heating, ventilation and air conditioning systems	80
UEENEEJ136A	Evaluate and report on building services energy management systems	80
UEENEEJ137A	Evaluate and report on the indoor air quality of buildings	40
UEENEEJ177A	Design hydrocarbon refrigerated systems	40
UEENEEJ181A	Design ammonia refrigerated systems	40
UEENEEJ183A	Design secondary refrigerant systems	40
UEENEEJ187A	Design carbon dioxide refrigerated systems	40
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 360 to a maximum of 480		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEJ139A	Develop specifications and prepare drawings for	60

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	HVAC/Refrigeration projects	
UEENEEJ141A	Design complex commercial refrigeration systems and select equipment	40
UEENEEJ142A	Design complex industrial refrigeration systems and select equipment	40
UEENEEJ143A	Design complex air conditioning systems and select equipment	120
UEENEEJ144A	Design mechanical ventilation/exhaust systems and select equipment	40
UEENEEJ145A	Design hydronic systems and select equipment	80
UEENEEJ146A	Design complex control systems for refrigeration or heating, ventilation, air conditioning systems	80
UEENEEJ149A	Develop heat exchanger design specifications	80
UEENEEJ150A	Evaluate new and alternative technologies applicable to electrotechnology applications	40

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.

END OF QUALIFICATION

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UEE62511 Advanced Diploma of Air-conditioning and Refrigeration Engineering

Modification History

Release	Action	Core/Elective	Details	Points
3	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
3	Update	Group A	HLTCPR211A Perform CPR	10
5	Update	Elective	HLTAID001 - Provide cardiopulmonary resuscitation	10
5	Edit	Core	Correct title of UEENEEJ102A - Prepare and connect refrigerant tubing and fittings	30
5	Edit	Elective	Correct title of UEENEEK145A - Implement and monitor energy sector environmental and sustainable policies and procedures	20

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Description

Scope

This qualification provides competencies to design and validate/evaluate refrigeration and air conditioning equipment and systems, manage risk, estimate and manage projects and provide technical advice/sales. It includes regulatory requirements for purchasing and handling refrigerants.

It develops competencies in the ethical and responsible application of mathematics, science, engineering techniques, Standards and Codes of Practice, engineering design practices, supervision and management of physical, human and financial resources in Refrigeration and Air Conditioning engineering.

Note:

The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

The core competencies of this qualification meet the prescribed requirements for Engineering Associate membership of Engineers Australia.

Participants seeking Engineers Australia membership should ensure that their training provider is accredited by that body to provide Engineering Education Programs at the level of Engineering Associate.

Pathways Information

Not Applicable

Licensing/Regulatory Information

Not Applicable

Entry Requirements

Not Applicable

Employability Skills Summary

Not Applicable

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 250 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEJ109A - Those holding an ‘Certificate III in Refrigeration and Air-conditioning trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40
UEENEEE103A	Solve problems in ELV single path circuits	40
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE137A	Document and apply measures to control OHS risks	20

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
	associated with electrotechnology work	
UEENEEJ040B	Manage refrigeration and air conditioning projects	40
UEENEEJ069B	Plan refrigeration and air conditioning projects	60
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories	60
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment	80
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants	60
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations	20
UEENEEJ110A	Select refrigerant piping, accessories and associated controls	50
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components	40
UEENEEJ113A	Commission air conditioning and refrigeration systems	40
UEENEEJ127A	Establish the thermodynamic parameters of refrigeration and air conditioning systems	80
UEENEEJ128A	Produce HVAC/R system design drawings	80
UEENEEJ129A	Establish heat loads for commercial refrigeration and/or air conditioning applications	80
UEENEEJ138A	Analyse vibration and noise in refrigeration and air conditioning systems	80

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems	50
UEENEEJ164A	Analyse the operation of HVAC air and hydronic systems	80
UEENEEJ165A	Evaluate thermodynamic and fluid parameters of refrigeration systems	100
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems	70
UEENEEJ192A	Analyse the psychrometric performance of HVAC/R systems	50
UEENEEJ194A	Solve problems in low voltage refrigeration circuits	40
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring	60
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures	20
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply	20
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply	20
Total points in core		**1910**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 250 points from the following groups:		
Group	**Minimum points**	**Maximum points**

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A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	120
B	**Qualification Elective Units**	0	30
C	**Qualification Elective Units**	0	60
D	**Qualification Elective Units**	0	120
E	**Qualification Elective Units** You may select all of your elective units from this Group	120	250

Group A – Imported and Common Electives Units You may complete units to a maximum weighting of 120		**Weighting Points**
BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
CPCCOHS1001A	Work safely in the construction industry	10
HLTAID001	Provide cardiopulmonary resuscitation	10
MEM16006A	Organise and communicate information	20
MEM16008A	Interact with computing technology	20
MEM30001A	Use computer aided drafting systems to produce basic engineering drawings	40
MEM30002A	Produce basic engineering graphics	40

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MEM30003A	Produce detailed engineering drawings	80
MEM30004A	Use CAD to create and display 3D models	40
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 120 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 30		**Weighting Points**
UEENEEJ114A	Resolve problems in hydronic systems	40
UEENEEJ115A	Resolve problems in beverage dispensers	40
UEENEEJ116A	Resolve problems in transport refrigeration systems	20
UEENEEJ117A	Resolve problems in ultra-low temperature refrigeration systems	20
UEENEEJ118A	Resolve problems in post mix refrigeration systems	20
UEENEEJ119A	Resolve problems in ice making systems	20
UEENEEJ166A	Resolve problems in dairy refrigeration systems	20
UEENEEJ167A	Resolve problems in central plant air conditioning systems	40
UEENEEJ168A	Maintain microbial control of refrigeration and air conditioning systems	20
UEENEEJ171A	Resolve problems in refrigerated beverage vending cabinets	20
UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	10
UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	20
UEENEEJ176A	Install and commission hydrocarbon refrigeration systems, components and associated equipment	20
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant	10
UEENEEJ179A	Repair and service ammonia refrigeration systems	20
UEENEEJ180A	Install and commission ammonia refrigeration systems, components and associated equipment	20
UEENEEJ182A	Repair and service secondary refrigeration systems	20
UEENEEJ184A	Apply safety awareness and legal requirements for	10

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	carbon dioxide refrigerant	
UEENEEJ185A	Repair and service carbon dioxide refrigeration systems	20
UEENEEJ186A	Install and commission carbon dioxide refrigeration systems, components and associated equipment	20
UEENEEJ188A	Repair and service self contained carbon dioxide refrigeration and heat pump systems	20

Group C – Qualification Elective Units You may complete units to a maximum weighting of 60		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEJ130A	Produce HVAC/R control system diagrams	40
UEENEEJ190A	Select basic commercial refrigeration system equipment, components and accessories	40
UEENEEJ191A	Select residential air conditioning system equipment, components and accessories	40
UEENEEK145A	Implement and monitor energy sector environmental and sustainable policies and procedures	20

Group D – Qualification Elective Units You may complete units to a maximum weighting of 120		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEJ132A	Design commercial refrigeration systems and select components	80
UEENEEJ133A	Design industrial refrigeration systems and select components	80

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UEENEEJ134A	Design heating, ventilation and air conditioning (HVAC) systems and select components	60
UEENEEJ135A	Design control systems for refrigeration or heating, ventilation and air conditioning systems	80
UEENEEJ136A	Evaluate and report on building services energy management systems	80
UEENEEJ137A	Evaluate and report on the indoor air quality of buildings	40
UEENEEJ177A	Design hydrocarbon refrigerated systems	40
UEENEEJ181A	Design ammonia refrigerated systems	40
UEENEEJ183A	Design secondary refrigerant systems	40
UEENEEJ187A	Design carbon dioxide refrigerated systems	40
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 120 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEJ139A	Develop specifications and prepare drawings for HVAC/Refrigeration projects	60
UEENEEJ141A	Design complex commercial refrigeration systems and select equipment	40
UEENEEJ142A	Design complex industrial refrigeration systems and select equipment	40
UEENEEJ143A	Design complex air conditioning systems and select equipment	120
UEENEEJ144A	Design mechanical ventilation/exhaust systems and select equipment	40
UEENEEJ145A	Design hydronic systems and select equipment	80

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UEENEEJ146A	Design complex control systems for refrigeration or heating, ventilation, air conditioning systems	80
UEENEEJ147A	Audit energy use for commercial HVAC/Refrigeration systems	40
UEENEEJ148A	Audit HVAC/R control systems for compliance with regulations and standards	60
UEENEEJ149A	Develop heat exchanger design specifications	80
UEENEEJ150A	Evaluate new and alternative technologies applicable to electrotechnology applications	40

Note:
1. Pre-requisite pathways shall be identified and met for all elective units selected.
2. In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level
3. Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.

END OF QUALIFICATION

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UEE63011 Advanced Diploma of Electrical Systems Engineering

Modification History

Release	Action	Core/Elective	Details	Points
2	Add	Group B	UETTDRIS44A Perform HV field switching operation to a given schedule	60
2	Add	Group D	UETTDRIS69A Diagnose and rectify faults in energy supply apparatus	60
2	Add	Group D	UETTDRIS70A Diagnose and rectify faults in electrical energy distribution systems	60
2	Add	Group D	UETTDRIS71A Diagnose and rectify faults in electrical energy supply transmission systems	60
2	Add	Group D	UETTDRIS72A Diagnose and rectify faults in distributed Generation systems	60
2	Add	Group E	UETTDRIS74A Develop engineering solutions for energy supply system protection problems	60
2	Edit		Edit Name to reflect correct Unit title UEENEED104A Use engineering applications software on personal computers	40
2	Edit		Edit Name to Reflect correct Unit Title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	
2	Edit		Move unit from Elective Group C to Group B UETTDRIS67A Solve problems in energy supply network equipment	
2	Edit		Move unit from Elective Group C to Group B UETTDRIS68A Solve problems in energy supply network protection equipment and systems	
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI102A Solve problems in pressure measurement components and systems	40

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3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI103A Solve problems in density_level measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI104A Solve problems in flow measurement components and systems	40
3	Edit	Group B	Edit Name to reflect correct Unit title UEENEEI105A Solve problems in temperature measurement components and systems	40
3	Edit	Group C	Edit Name to reflect correct Unit title UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.	60

4	Edit	Core	Correct title of UEENEEG199A - Conduct compliance and functional verification of electrical apparatus and existing circuits	40
4	Edit	Elective	Correct title of UEENEEE127A - Use advanced computational processes to provide solutions to energy sector engineering problems	80
4	Edit	Elective	Correct title of UEENEEE128A - Develop engineering solutions to photonic system problems	80
4	Edit	Elective	Correct title of UEENEEE161A - Analyse static and dynamic parameters of electrical equipment	80
4	Edit	Elective	Correct title of UEENEEE162A - Select drive components for electrical equipment design	80
4	Edit	Elective	Correct title of UEENEEE163A - Analyse materials for suitability in electrical equipment	80
4	Edit	Elective	Correct title of UEENEEG110A - Find and repair faults in LV d.c. electrical apparatus and circuits	60
4	Edit	Elective	Correct title of UEENEEG111A - Carry out basic repairs to electrical components and equipment	40
4	Edit	Elective	Correct title of UEENEEG116A - Diagnose and rectify faults in traction lift systems	80

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4	Edit	Elective	Correct title of UEENEEG119A - Maintain operation of electrical marine equipment and systems	60
4	Edit	Elective	Correct title of UEENEEG120A - Select and arrange equipment for special LV electrical installations	60
4	Edit	Elective	Correct title of UEENEEG125A - Plan electrical installations with a low voltage demand up to 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG127A - Design electrical installations with a low voltage demand greater than 400 A per phase	40
4	Edit	Elective	Correct title of UEENEEG128A - Plan low voltage switchboard and control panel layouts	40
4	Edit	Elective	Correct title of UEENEEG129A - Overhaul and repair major switchgear and controlgear	60
4	Edit	Elective	Correct title of UEENEEG130A - Design switchboards rated for high fault levels (greater than 400 A)	60
4	Edit	Elective	Correct title of UEENEEG131A - Evaluate performance of low voltage electrical apparatus	40
4	Edit	Elective	Correct title of UEENEEG143A - Develop engineering solution for synchronous machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG144A - Develop engineering solutions for d.c. machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG145A - Develop engineering solutions for induction machine and control problems	60
4	Edit	Elective	Correct title of UEENEEG153A - Rewind three phase low voltage induction machines	60
4	Edit	Elective	Correct title of UEENEEG155A - Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
4	Edit	Elective	Correct title of UEENEEG156A - Rewind HV three phase induction machines rated for voltages above	60

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			3.3 kV	
4	Edit	Elective	Correct title of UEENEEG159A - Conduct mechanical tests on electrical machines and components	40
4	Edit	Elective	Correct title of UEENEEG161A - Design and develop modifications to LV electrical machines	60
4	Edit	Elective	Correct title of UEENEEG164A - Repair and maintain mechanical components of electrical machines	40
4	Edit	Elective	Correct title of UEENEEG165A - Maintain and service traction lifts systems and equipment	40
4	Edit	Elective	Correct title of UEENEEG166A - Install and maintain escalators, moving walks and treadways	40
4	Edit	Elective	Correct title of UEENEEG167A - Align and install traction lift equipment	20
4	Edit	Elective	Correct title of UEENEEG168A - Diagnose and rectify faults in complex lift systems	40
4	Edit	Elective	Correct title of UEENEEG172A - Investigate and report on electrical incidents and causes	60
4	Edit	Elective	Correct title of UEENEEG185A - Select effective and efficient light sources and luminaries for given locations and designs	60
4	Edit	Elective	Correct title of UEENEEH102A - Repairs basic electronic apparatus faults by replacement of components	40
4	Edit	Elective	Correct title of UEENEEH147A - Assess electronic apparatus compliance	60
4	Edit	Elective	Correct title of UEENEEH150A - Assemble and set up basic security systems	80
4	Edit	Elective	Correct title of UEENEEH184A - Modify digital signal processing (DSP) based sub-systems	80
4	Edit	Elective	Correct title of UEENEEH185A - Design signal-conditioning subsystems	80
4	Edit	Elective	Correct title of UEENEEH188A - Design and	40

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			develop electronics - computer systems projects	
4	Edit	Elective	Correct title of UEENEEI101A - Use instrumentation drawings, specification, standards and equipment manuals	40
4	Edit	Elective	Correct title of UEENEEI103A - Solve problems in density/level measurement components and systems	40
4	Edit	Elective	Correct title of UEENEEI116A - Assemble, enter and verify operating instructions in microprocessor equipped devices	20
4	Edit	Elective	Correct title of UEENEEI119A - Set up industrial field control devices	60
4	Edit	Elective	Correct title of UEENEEI123A - Design electronic control systems	60
4	Edit	Elective	Correct title of UEENEEI126A - Provide solutions to pneumatic-hydraulic system operations	80
4	Edit	Elective	Correct title of UEENEEI128A - Set up and configure controls on complex fluid systems	80
4	Edit	Elective	Correct title of UEENEEI148A - Solve problems in single phase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI149A - Solve problems in polyphase electronic power control circuits	60
4	Edit	Elective	Correct title of UEENEEI154A - Design and use advanced programming tools PC networks and HMI Interfacing	120
4	Edit	Elective	Correct title of UEENEEK138A - Design micro-hydro systems rated to 6.4 kW	60
4	Edit	Elective	Correct title of UEENEEK139A - Design stand-alone renewable energy (RE) systems	40
4	Edit	Elective	Correct title of UEENEEK140A - Develop engineering solutions to renewable energy (RE) problems	60
4	Edit	Elective	Correct title of UEENEEK146A - Design energy management controls for electrical installations in buildings	80

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4	Edit	Elective	Correct title of UEENEEK151A - Develop effective engineering strategies for energy reduction in buildings	60
4	Edit	Elective	Correct title of UEENEEM039A - Conduct testing of hazardous areas installations - gas atmospheres	40
4	Edit	Elective	Correct title of UEENEEM079A - Design of gas detection systems	20
4	Edit	Elective	Correct title of UEENEEM080A - Report on the integrity of explosion-protected equipment in a hazardous area	20
4	Edit	Elective	Correct title of UETTDRIS44A - Perform HV field switching operation to a given schedule	40

Description

Scope

This qualification provides competencies to develop, design and validate/evaluate, select, commission, maintain and diagnose faults/malfunctions on advanced electrical equipment and systems. Also, provides skills to manage risk, estimate and manage projects and provide technical advice/sales.

It develops competencies in the ethical and responsible application of mathematics, science, engineering techniques, Standards and Codes of Practice, engineering design practices, supervision and management of physical, human and financial resources in engineering.

Pathways Information

Not applicable.

Licensing/Regulatory Information

Not applicable.

Entry Requirements

Not applicable.

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Employability Skills Summary

Not applicable.

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Packaging Rules

Completion requirements

The requirements for granting this qualification will be met when competency is demonstrated and achieved for:

- All the Core competency standard units, defined in the Core Competency Standard Units table below and
- A combination of Elective competency standard units to achieve a total weighting of 580 points in accordance with the Elective Competency Standard Units table below.

Note: UEENEEG199A - Those holding an 'Unrestricted Electrical Fitter Licence or equivalent issued in an Australian State or Territory meet the requirements of this unit and its pre-requisite requirements.

Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEED104A	Use engineering applications software on personal computers	40
UEENEEE006B	Apply methods to maintain currency of industry developments	20
UEENEEE011C	Manage risk in electrotechnology activities	60
UEENEEE015B	Develop design briefs for electrotechnology projects	40
UEENEEE071B	Write specifications for electrical engineering projects	40
UEENEEE080A	Apply industry and community standards to engineering activities	20
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	60
UEENEEE082A	Appl`y physics to solving electrotechnology engineering problems	60
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	120
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	40

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEE104A	Solve problems in d.c. circuits	80
UEENEEE105A	Fix and secure electrotechnology equipment	20
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	40
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	20
UEENEEE124A	Compile and produce an energy sector detailed report	60
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	60
UEENEEE126A	Provide solutions to basic engineering computational problems	60
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	20
UEENEEG006A	Solve problems in single and three phase low voltage machines	80
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	60
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	40
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	60
UEENEEG102A	Solve problems in low voltage a.c. circuits	80
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	40
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits	40
UEENEEG109A	Develop and connect electrical control circuits	80
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	60

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Core Competency Standard Units All Core competency standard units to be achieved		**Weighting Points**
UEENEEG169A	Manage large electrical projects	40
UEENEEG170A	Plan large electrical projects	60
UEENEEG199A	Conduct compliance and functional verification of electrical apparatus and existing circuits	40
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	20
Total points in core		**1580**

Elective Competency Standard Units Complete Elective units to achieve a total of weighting of 580 points from the following groups:			
Group		**Minimum points**	**Maximum points**
A	**Imported and Common Elective Units** Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points.	0	220
B	**Qualification Elective Units**	0	160
C	**Qualification Elective Units**	0	160
D	**Qualification Elective Units**	0	160
E	**Qualification Elective Units** You may select the majority of your elective units from this Group	200	580

Group A – Imported and Common Electives Units You may complete units to a maximum weighting of 220	**Weighting Points**

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BSBMGT502B	Manage people performance	70
BSBINM501A	Manage an information or knowledge management system	50
BSBMGT516C	Facilitate continuous improvement	60
BSBINN502A	Build and sustain an innovative work environment	50
BSBWOR502B	Ensure team effectiveness	60
	Imported units from other training packages and/or state accredited courses can be added to this group, but they must be selected from qualifications where the unit is first packaged at AQF level 6. If units have not being assigned a weighting by the relevant EE-Oz Industry Technical Advisory Committee, their weighting will be 10 points. Note: For further information see Application of the NQC Flexibility Formula, UEE11 Electrotechnology Training Package, Version 1, Volume 1 Qualification Framework	Up to 220 points

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Group B – Qualification Elective Units You may complete units to a maximum weighting of 160		**Weighting Points**
UEENEEA110A	Assemble, mount and connect control gear and switchgear	40
UEENEEA112A	Fabricate and assemble bus bars	40
UEENEEA113A	Mount and wire control panel equipment	40
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	60
UEENEEG110A	Find and repair faults in LV d.c. electrical apparatus and circuits	60
UEENEEG111A	Carry out basic repairs to electrical components and equipment	40
UEENEEG116A	Diagnose and rectify faults in traction lift systems	80
UEENEEG118A	Maintain operation of electrical mining equipment and systems	60
UEENEEG119A	Maintain operation of electrical marine equipment and systems	60
UEENEEG120A	Select and arrange equipment for special LV electrical installations	60
UEENEEG129A	Overhaul and repair major switchgear and controlgear	60
UEENEEG150A	Wind electrical coils	40
UEENEEG151A	Place and connect electrical coils	40
UEENEEG152A	Rewind single phase machines	40
UEENEEG153A	Rewind three phase low voltage induction machines	60
UEENEEG154A	Rewind LV direct current machines	60
UEENEEG157A	Conduct electrical tests on LV electrical machines	40
UEENEEG159A	Conduct mechanical tests on electrical machines and components	40
UEENEEG164A	Repair and maintain mechanical components of electrical machines	40

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UEENEEG165A	Maintain and service traction lifts systems and equipment	40
UEENEEG166A	Install and maintain escalators, moving walks and treadways	40
UEENEEG167A	Align and install traction lift equipment	20
UEENEEG171A	Install, set up and commission interval metering	20
UEENEEG181A	Provide advice on effective and energy efficient lighting products	20
UEENEEG182A	Supply effective and efficient lighting products for domestic and small commercial applications	40
UEENEEG183A	Provide advice on the application of energy efficient lighting for ambient and aesthetic effect	20
UEENEEG189A	Install and maintain emergency lighting systems	40
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components	40
UEENEEH111A	Troubleshoot single phase input d.c. power supplies	40
UEENEEH150A	Assemble and set up basic security systems	80
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals	40
UEENEEI102A	Solve problems in pressure measurement components and systems	40
UEENEEI103A	Solve problems in density/level measurement components and systems	40
UEENEEI104A	Solve problems in flow measurement components and systems	40
UEENEEI105A	Solve problems in temperature measurement components and systems	40
UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	20
UEENEEI138A	Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives	60
UEENEEI140A	Plan the electrical installation of integrated systems	20

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UEENEEI141A	Develop electrical integrated systems	20
UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	60
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings	30
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems	60
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems	20
UEENEEM019A	Attend to breakdowns in hazardous areas — coal mining	20
UEENEEM020A	Attend to breakdowns in hazardous areas — gas atmospheres	20
UEENEEM021A	Attend to breakdowns in hazardous areas — dust atmospheres	20
UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation	20
UEENEEM027A	Maintain equipment in hazardous areas — coal mining	60
UEENEEM028A	Maintain equipment in hazardous areas — gas atmospheres	60
UEENEEM029A	Maintain equipment in hazardous areas — dust atmospheres	60
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation	60
UEENEEM038A	Conduct testing of hazardous areas installations — coal mining	40
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area	20
UETTDRIS43A	Perform low voltage field switching operation to a given schedule.	50
UETTDRIS44A	Perform HV field switching operation to a given schedule	40
UETTDRIS47A	Sample, test, filter and reinstate insulating oil	40
UETTDRIS67A	Solve problems in energy supply network equipment	80
UETTDRIS68A	Solve problems in energy supply network protection	40

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	equipment and systems	
UETTDRSB29A	Maintain capacitor bank equipment for voltage regulation	40
UETTDRSB39A	Perform power system substation switching operation to a given schedule	50

Group C – Qualification Elective Units You may complete units to a maximum weighting of 160		**Weighting Points**
UEENEEC005B	Estimate electrotechnology projects	40
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase	40
UEENEEG128A	Plan low voltage switchboard and control panel layouts	40
UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV	60
UEENEEG156A	Rewind HV three phase induction machines rated for voltages above 3.3 kV	60
UEENEEG158A	Conduct electrical tests on HV electrical machines	60
UEENEEG162A	Set up and place LV electrical apparatus and associated circuits into service	40
UEENEEG168A	Diagnose and rectify faults in complex lift systems	40
UEENEEG172A	Investigate and report on electrical incidents and causes	60
UEENEEG175A	Develop compliance policies and plans to conduct a electrical contracting business	80
UEENEEG179A	Develop detailed electrical drawings	60
UEENEEG184A	Provide photometric data for illumination system design	60
UEENEEG185A	Select effective and efficient light sources and luminaries for given locations and designs	60
UEENEEG186A	Design effective and efficient lighting for residential and commercial buildings	20
UEENEEG188A	Prepare quotations for the supply of effective and efficient lighting products for lighting projects	20

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UEENEEI119A	Set up industrial field control devices	60
UEENEEI120A	Provide solutions to problems in industrial control systems	60
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems	60
UEENEEI125A	Provide solutions to fluid circuit operations	60
UEENEEI126A	Provide solutions to pneumatic-hydraulic system operations	80
UEENEEI139A	Diagnose and rectify faults in digital controls systems	60
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen	20
UEENEEI143A	Develop access control of electrical integrated systems using logic-based programming tools	20
UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	20
UEENEEI148A	Solve problems in single phase electronic power control circuits	60
UEENEEI149A	Solve problems in polyphase electronic power control circuits	60
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.	60
UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	60
UEENEEI155A	Develop structured programs to control external devices	40
UEENEEM039A	Conduct testing of hazardous areas installations - gas atmospheres	40
UEENEEM042A	Conduct visual inspection of hazardous areas installations	40
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres	40
UEENEEM047A	Develop and manage maintenance programs for hazardous areas electrical equipment — coal mining	20

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UEENEEM078A	Manage compliance of hazardous areas	20

Group D – Qualification Elective Units You may complete units to a maximum weighting of 160		**Weighting Points**
UEENEEC006B	Prepare tender submissions for electrotechnology projects	60
UEENEEE110A	Develop and implement energy sector maintenance programs	60
UEENEEG127A	Design electrical installations with a low voltage demand greater than 400 A per phase	40
UEENEEG131A	Evaluate performance of low voltage electrical apparatus	40
UEENEEG180A	Develop detailed and complex drawings for electrical systems using CAD systems	60
UEENEEG187A	Design effective and efficient lighting for public, open and sports areas	20
UEENEEI127A	Analyse complex electronic circuits controlling fluids	80
UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	60
UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	60
UEENEEI147A	Diagnose and rectify faults in servo drive systems	60
UEENEEI156A	Develop and test code for microcontroller devices	60
UEENEEI157A	Configure and maintain industrial control system networks	60
UEENEEK129A	Design renewable energy (RE) heating systems	120
UEENEEK131A	Design wind energy conversion systems (WECS) rated to 10 kW	60
UEENEEK138A	Design micro-hydro systems rated to 6.4 kW	60
UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment — coal mining	40
UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment — gas atmospheres	40
UEENEEM037A	Conduct a conformity assessment of explosion-protected	40

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	equipment — dust atmospheres	
UEENEEM054A	Plan electrical installations for hazardous areas — gas atmospheres	20
UEENEEM064A	Conduct audit of hazardous areas installations — coal mining	60
UEENEEM065A	Conduct audit of hazardous areas installations — gas atmospheres	60
UEENEEM066A	Conduct audit of hazardous areas installations — dust atmospheres	60
UEENEEM067A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — coal mining	60
UEENEEM068A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — gas atmospheres	60
UEENEEM069A	Assess the fitness-for-purpose of hazardous areas explosion-protected equipment — dust atmospheres	60
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus	60
UETTDRIS70A	Diagnose and rectify faults in electrical energy distribution systems	60
UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission systems	60
UETTDRIS72A	Diagnose and rectify faults in distributed Generation systems	60

Group E – Qualification Elective Units You must complete units to a minimum weighting of 200 You may select all your elective units from this Group		**Weighting Points**
UEENEEC007B	Manage contract variations	40
UEENEEE127A	Use advanced computational processes to provide solutions to energy sector engineering problems	80
UEENEEE128A	Develop engineering solutions to photonic system problems	80
UEENEEE160A	Provide engineering solutions for uses of materials and	80

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	thermodynamic effects	
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment	80
UEENEEE162A	Select drive components for electrical equipment design	80
UEENEEE163A	Analyse materials for suitability in electrical equipment	80
UEENEEE164A	Design electrical machine drives and production layout plans	80
UEENEEE078B	Contribute to risk management in electrotechnology systems	20
UEENEEG130A	Design switchboards rated for high fault levels (greater than 400 A)	60
UEENEEG143A	Develop engineering solution for synchronous machine and control problems	60
UEENEEG144A	Develop engineering solutions for d.c. machine and control problems	60
UEENEEG145A	Develop engineering solutions for induction machine and control problems	60
UEENEEG160A	Evaluate performance of LV electrical machines	40
UEENEEG161A	Design and develop modifications to LV electrical machines	60
UEENEEH147A	Assess electronic apparatus compliance	60
UEENEEH184A	Modify digital signal processing (DSP) based sub-systems	80
UEENEEH185A	Design signal-conditioning subsystems	80
UEENEEH188A	Design and develop electronics - computer systems projects	40
UEENEEI123A	Design electronic control systems	60
UEENEEI128A	Set up and configure controls on complex fluid systems	80
UEENEEI129A	Set up electronically controlled mechanically operated complex systems	80
UEENEEI130A	Set up electronically controlled robotically operated	80

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	complex systems	
UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	60
UEENEEI154A	Design and use advanced programming tools PC networks and HMI Interfacing	120
UEENEEK133A	Design hybrid renewable power systems	80
UEENEEK139A	Design stand-alone renewable energy (RE) systems	40
UEENEEK140A	Develop engineering solutions to renewable energy (RE) problems	60
UEENEEK146A	Design energy management controls for electrical installations in buildings	80
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings	60
UEENEEM052A	Classify hazardous areas — gas atmospheres	40
UEENEEM053A	Classify hazardous areas — dust atmospheres	40
UEENEEM057A	Design explosion-protected electrical systems and installations — gas atmospheres	20
UEENEEM058A	Design explosion-protected electrical systems and installations — dust atmospheres	20
UEENEEM059A	Design explosion-protected electrical systems and installations — pressurisation	20
UEENEEM075A	Design explosion-protected electrical systems — Coal mining	20
UEENEEM079A	Design of gas detection systems	20
UETTDRIS73A	Develop engineering solutions for energy supply power transformer problems	60
UETTDRIS74A	Develop engineering solutions for energy supply system protection problems	60

Note:
1.Pre-requisite pathways shall be identified and met for all elective units selected.

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2.In selecting elective units considerations to career planning advice should be given to units that form part of a pre-requisite pathway for the progression to achieve particular competencies or qualification at a higher level.
3.Registered training organisations shall also provide information related to the relevant pathway(s) that may be taken to achieve paraprofessional status ("associate membership") with a professional engineering membership organisation.
END OF QUALIFICATION

Custom Content Section

Not applicable.

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UEESS00048 Data Communications - ACMA 'Open' Cabling Provider

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

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Skill Set Requirements

UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Target Group

This skill set is available to anyone wishing to undertake work in telecommunication cabling requiring ACMA ‘Open’ Cabling Provider Registration.
Note:
This Skill Set meets the minimum ACMA ‘prescribed level of knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved’ for ACMA ‘Open’ Cabling Provider Registration.
Those holding an unrestricted Electricians Licence and can demonstrate currency, meet the requirements of UEENEEE101A, UEENEEE102A, UEENEEE104A, UEENEEE105A and UEENEEE107A and all their pre-requisites.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for ACMA ‘Open’ Cabling Provider

Custom Content Section

Not applicable.

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UEESS00049 Data Communications - ACMA Restricted Telecommunications Cabling Registration

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate II, Certificate III and Certificate IV, qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

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Skill Set Requirements

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF101A	Install and connect cabling for direct access to telecommunications service

Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:
UEENEEF106A Solve problems in voice and data communications circuits
Note:
This Skill Set meets the minimum ACMA 'prescribed level of knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved' for ACMA 'Restricted' Cabling Provider Registration.
Those holding an unrestricted Electricians Licence and can demonstrate currency, meet the requirements of UEENEEE101A, UEENEEE102A, UEENEEE105A and UEENEEE107A and all their pre-requisites.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for ACMA Restricted Telecommunications Cabling Registration.

Custom Content Section

Not applicable.

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UEESS00050 Data Communications - Install Aerial Communication Cables

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE102A Fabricate, assemble and dismantle utilities industry components
UEENEEE104A Solve problems in d.c. circuits
UEENEEE105A Fix and secure electrotechnology equipment
UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A Install and maintain cabling for multiple access to telecommunication services
UEENEEF112A Install aerial telecommunication cables

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Target Group

This skill set is available to anyone wishing to undertake work in telecommunication cabling requiring ACMA 'Open' Cabling Provider Registration with aerial endorsement.
Note:
This Skill Set meets the minimum ACMA 'prescribed level of knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved' for ACMA 'Open' Cabling Provider Registration with aerial endorsement.
Those holding an ACMA 'Open' Cabling Provider Registration and can demonstrate currency, meet the requirements of UEENEEF102A and all its pre-requisites
Those holding an unrestricted Electricians Licence and can demonstrate currency, meet the requirements of UEENEEE101A, UEENEEE102A, UEENEEE104A, UEENEEE105A and UEENEEE107A and all their pre-requisites.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install aerial communication cables

Custom Content Section

Not applicable.

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UEESS00051 Data Communications - Install and Modify Performance Data Communication Optical Fibre Cabling

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

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Skill Set Requirements

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services
UEENEEF105A	Install and modify optical fibre performance data communication cabling

Target Group

This skill set is available to anyone wishing to undertake work in telecommunication cabling requiring ACMA ‘Open’ Cabling Provider Registration with Fibre Optic endorsement.
Note:
This Skill Set meets the minimum ACMA ‘prescribed level of knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved’ for ACMA ‘Open’ Cabling Provider Registration with Fibre Optic endorsement.
Those holding an ACMA ‘Open’ Cabling Provider Registration and can demonstrate currency, meet the requirements of UEENEEF102A and all its pre-requisites
Those holding an unrestricted Electricians Licence and can demonstrate currency, meet the requirements of UEENEEE101A, UEENEEE102A, UEENEEE104A, UEENEEE105A and UEENEEE107A and all their pre-requisites.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install and modify performance data communication optical fibre cabling

Custom Content Section

Not applicable.

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UEESS00052 Data Communications - Install and Modify Performance Data Communication Structured Cabling

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services
UEENEEF104A	Install and modify performance data communication copper cabling

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Target Group

This skill set is available to anyone wishing to undertake work in telecommunication cabling requiring ACMA 'Open' Cabling Provider Registration with structured cabling endorsement.
Note:
This Skill Set meets the minimum ACMA 'prescribed level of knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved' for ACMA 'Open' Cabling Provider Registration with structured cabling endorsement.
Those holding an ACMA 'Open' Cabling Provider Registration and can demonstrate currency, meet the requirements of UEENEEF102A and all its pre-requisites
Those holding an unrestricted Electricians Licence and can demonstrate currency, meet the requirements of UEENEEE101A, UEENEEE102A, UEENEEE104A, UEENEEE105A and UEENEEE107A and all their pre-requisites.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install and modify performance data communication structured cabling

Custom Content Section

Not applicable.

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UEESS00053 Data Communications - Install Below Ground Communication Cables

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

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Skill Set Requirements

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services
UEENEEF113A	Install underground communication cables

Target Group

This skill set is available to anyone wishing to undertake work in telecommunication cabling requiring ACMA 'Open' Cabling Provider Registration with underground endorsement.
Note:
This Skill Set meets the minimum ACMA 'prescribed level of knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved' for ACMA 'Open' Cabling Provider Registration with underground endorsement.
Those holding an ACMA 'Open' Cabling Provider Registration and can demonstrate currency, meet the requirements of UEENEEF102A and all its pre-requisites
Those holding an unrestricted Electricians Licence and can demonstrate currency, meet the requirements of UEENEEE101A, UEENEEE102A, UEENEEE104A, UEENEEE105A and UEENEEE107A and all their pre-requisites.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install below ground communication cables

Custom Content Section

Not applicable.

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UEESS00054 Data Communications - Restricted Telecommunications Cabler Registration - ACMA

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate II, Certificate III and Certificate IV, qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE102A Fabricate, assemble and dismantle utilities industry components
UEENEEE104A Solve problems in d.c. circuits
UEENEEE105A Fix and secure electrotechnology equipment
UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF101A Install and connect cabling for direct access to telecommunications service.

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:
UEENEEE103A Solve problems in ELV single path circuits
Note:
This Skill Set meets the minimum ACMA 'prescribed level of knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved' for ACMA 'Restricted' Cabling Provider Registration.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Restricted Telecommunications Cabler Registration - ACMA

Custom Content Section

Not applicable.

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UEESS00056 Electrical - Install and Set Up Interval Metering

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEG171A Install, set up and commission interval metering

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install and set up interval metering

Custom Content Section

Not applicable.

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UEESS00057 Electrical - Providing advice on lighting products

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEG181A Provide advice on effective and energy efficient lighting products
UEENEEG182A Supply effective and efficient lighting products for domestic and small commercial applications

Target Group

It is essential that anyone undertaking this skill set works in the electrical and/or retail industry where customers will seek a advice on effective and energy efficient lighting products

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Electrical – Providing advice on lighting products

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Custom Content Section

Not applicable.

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UEESS00058 Electronic - Fire Detection and Alarm Systems - Installation, Maintenance, Commissioning and Servicing

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEH161A Install fire detection and warning system apparatus
UEENEEH162A Verify compliance and functionality of fire protection system installations
UEENEEH163A Enter and verify programs for fire protection systems
UEENEEH164A Commission large fire protection systems
UEENEEH165A Troubleshoot fire protection systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:
UEENEEE102A, Fabricate, assemble and dismantle utilities industry components
UEENEEE105A, Fix and secure electrotechnology equipment
UEENEEE107A, Use drawings, diagrams, schedules, standards, codes and specifications
OR
A current unrestricted electrical licence issued in an Australian State or Territory.
Note: As agreed with the Fire Protection Industry (ODS & SGG) Board, existing workers in the fire protection sector may be deemed to have met the above pre-requisite competencies if they:

- Hold the Australian Communications and Media Authority's restricted or open cablers registration and can demonstrate three (3) years wiring and installation experience in the fire protection sector.

OR

- Hold the Australian Communications and Media Authority's open cablers registration and can demonstrate three (3) years wiring and installation experience in the security or communications sectors.
-

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install and set up interval metering

Custom Content Section

Not applicable.

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UEESS00059 Hazardous Areas - Attend to Breakdowns in Hazardous Areas - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM019A Attend to breakdowns in hazardous areas - coal mining
UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

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Target Group

It is essential that anyone undertaking this skill set already holds the Competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least AQF level 3 or equivalent.
Note :
This Skill Set is directly equivalent to the Unit 2.3 Attend to breakdowns in hazardous areas in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM019A

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Attend to breakdowns in hazardous areas - coal mining

Custom Content Section

Not applicable.

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UEESS00060 Hazardous Areas - Carry Out Overhaul and Repair of Explosion-Protected Equipment - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM060A Carry out overhaul and repair of explosion-protected equipment - coal mining

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG164A Repair and maintain mechanical components of electrical machines
Note :
This Skill Set is directly equivalent to the Unit 2.20 Carry out overhaul and repair of explosion-protected equipment in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM060A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Carry out overhaul and repair of explosion-protected equipment - coal mining

Custom Content Section

Not applicable.

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UEESS00061 Hazardous Areas - Conduct a Conformity Assessment of Explosion-Protected Equipment - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE124A Compile and produce an energy sector detailed report
UEENEEM035A Conduct a conformity assessment of explosion-protected equipment - coal mining

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Target Group

It is essential that anyone undertaking this skill set already holds the relevant AQF 5 Qualification from the UEE11 Electrotechnology Training Package or equivalent
Note :
This Skill Set is directly equivalent to the Unit 2.9 Conduct a conformity assessment of explosion-protected equipment in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEE035A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Conduct a conformity assessment of explosion-protected equipment - for coal mining

Custom Content Section

Not applicable.

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UEESS00062 Hazardous Areas - Conduct Audit of Hazardous Areas Installations - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM064A Conduct audit of hazardous areas installations - coal mining
UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

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Target Group

It is essential that anyone undertaking this skill set already holds the Relevant AQF 5 Post Trade Qualification from the UEE11 Electrotechnology Training Package or equivalent
Note :
This Skill Set is directly equivalent to the Unit 2.21 Conduct audit of hazardous areas installations in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM064A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Conduct audit of hazardous areas installations - coal mining

Custom Content Section

Not applicable.

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UEESS00063 Hazardous Areas - Conduct Detailed Inspection of Hazardous Areas Installations - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM043A Conduct detailed inspection of hazardous areas installations - coal mining

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEM023A Install explosion-protected equipment and wiring systems — coal mining
OR
UEENEEM027A Maintain equipment in hazardous areas — coal mining
Note :
This Skill Set is directly equivalent to the Unit 2.12 Conduct detailed inspection of hazardous areas installations in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM043A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Conduct detailed inspection of hazardous areas installations - coal mining

Custom Content Section

Not applicable.

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UEESS00064 Hazardous Areas - Conduct Testing of Hazardous Areas Installations - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM038A Conduct testing of hazardous areas installations - coal mining

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEM023A Install explosion-protected equipment and wiring systems — coal mining
OR
UEENEEM027A Maintain equipment in hazardous areas — coal mining
Note :
This Skill Set is directly equivalent to the Unit 2.10 Conduct testing of hazardous areas installations in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM038A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Conduct testing of hazardous areas installations - coal mining.

Custom Content Section

Not applicable.

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UEESS00065 Hazardous Areas - Design Explosion-Protected Electrical Systems - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM075A Design explosion-protected electrical systems - Coal mining

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEE015B Develop design briefs for electro technology projects
Note :
This Skill Set is directly equivalent to the Unit 2.18 Design explosion-protected electrical systems and installations in the Australian/New Zealand Standard AS/NZS 4761.1:2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM075A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Design explosion-protected electrical systems - Coal mining

Custom Content Section

Not applicable.

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UEESS00066 Hazardous Areas - Develop and Manage Maintenance Programs for Hazardous Areas Electrical Equipment - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM047A Develop and manage maintenance programs for hazardous areas electrical equipment - coal mining

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEE110A Develop and implement energy sector maintenance programs
Note :
This Skill Set is directly equivalent to the Unit 2.18 Develop and manage maintenance programs for hazardous areas electrical equipment in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM047A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Develop and manage maintenance programs for hazardous areas electrical equipment - coal mining

Custom Content Section

Not applicable.

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UEESS00068 Hazardous Areas - Install Explosion-Protected Equipment and Wiring Systems - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM023A Install explosion-protected equipment and wiring systems - coal mining
UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory.
Note :
This Skill Set is directly equivalent to the Unit 2.5 Install explosion-protected equipment and wiring systems in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM023A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install explosion-protected equipment and wiring systems - coal mining

Custom Content Section

Not applicable.

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UEESS00069 Hazardous Areas - Maintain Equipment in Hazardous Areas - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM027A Maintain equipment in hazardous areas - coal mining
UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory.
Note :
This Skill Set is directly equivalent to the Unit 2.7 Maintain equipment in hazardous areas in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM027A

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Maintain equipment in hazardous areas - coal mining

Custom Content Section

Not applicable.

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UEESS00070 Hazardous Areas - Overhaul and Repair of Explosion-Protected Equipment - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM031A Overhaul and repair of explosion-protected equipment - coal mining

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Target Group

It is essential that anyone undertaking this skill set already holds the relevant AQF 3 Trade Qualification from the UEE11 Electrotechnology Training Package or equivalent
Note :
This Skill Set is directly equivalent to the Unit 2.8 Overhaul and repair of explosion-protected equipment in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM031A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Overhaul and repair of explosion-protected equipment - coal mining

Custom Content Section

Not applicable.

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UEESS00071 Hazardous Areas - Plan Electrical Installations in Hazardous Areas - Coal Mining

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM074A Plan electrical installations in hazardous areas - Coal mining

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG125A Plan electrical installations with a low voltage demand up to 400 A per phase
Note :
This Skill Set is directly equivalent to the Unit 2.17 Plan electrical installations in hazardous areas in the Australian/New Zealand Standard AS/NZS 4761.1; 2008 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards.
Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of the unit UEENEEM074A.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Plan electrical installations in hazardous areas - Coal mining

Custom Content Section

Not applicable.

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UEESS00073 Instrumentation - Develop a integrated system interface for access through a touch screen

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The unit of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEI142A Develop an electrical integrated system interface for access through a touch screen

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Target Group

It is essential that anyone undertaking this skill set already holds Competency Standard Unit: UEENEEI141A Develop electrical integrated systems
Also, it may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for developing basic touch screen access in an integrated system

Custom Content Section

Not applicable.

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UEESS00074 Instrumentation - Develop access control of integrated systems using logic-based programming tools

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The unit of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEI143A Develop access control of electrical integrated systems using logic-based programming tools

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Target Group

It is essential that anyone undertaking this skill set already holds Competency Standard Unit: UEENEEI142A Develop an electrical integrated system interface for access through a touch screen
and seek to expand the competency to using logic-based programming tools.
Also, it may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for developing access control of integrated system using logic-based programming tools.

Custom Content Section

Not applicable.

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UEESS00075 Instrumentation - Develop integrated systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The unit of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEI141A Develop integrated electrical systems

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Target Group

It is essential that anyone undertaking this skill set already holds Competency Standard Units in electrical, electronic and data communication work and competency in the use of personal computers. Examples of a suitable competencies are (but not limited to):
UEENEEE108A Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits
or
UEENEEG106A Terminate cables, cords and accessories for low voltage circuits
and
UEENEED101A Use computer applications relevant to a workplace
Also, it is suitable for employment-based programs under an approved contract of training and may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for developing integrated systems

Custom Content Section

Not applicable.

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UEESS00076 Instrumentation - Develop interfaces for multiple access methods to monitor, schedule and control an integrated system

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The unit of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEI144A Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system

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Target Group

It is essential that anyone undertaking this skill set already holds Competency Standard Unit: UEENEEI142A Develop an electrical integrated system interface for access through a touch screen
and seek to expand the competency to developing multiple access of an integrated system. Also, it may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for developing multiple access control of integrated systems.

Custom Content Section

Not applicable.

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UEESS00077 Instrumentation - Plan the installation of integrated systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The unit of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEI140A Plan the electrical installation of integrated systems

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Target Group

It is essential that anyone undertaking this skill set already holds Competency Standard Units in electrical, electronic and data communication work. Examples of a suitable competency is (but not limited to):
UEENEEE108A Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits
or
UEENEEG106A Terminate cables, cords and accessories for low voltage circuits
It is suitable for employment-based programs under an approved contract of training and may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Planning Integrated Systems

Custom Content Section

Not applicable.

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UEESS00078 Refrigeration-Air Conditioning - Design Ammonia Refrigeration Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ132A	Design commercial refrigeration systems and select components
UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant
UEENEEJ181A	Design ammonia refrigerated systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems
Note: Those holding any of the following qualifications from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of UEENEEJ165A and its pre-requisites.

- Diploma of Refrigeration and Air-conditioning Engineering
- Advanced Diploma of Refrigeration and Air-conditioning Engineering
- Advanced Diploma of Refrigeration and Air-conditioning - Technology
-

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Design ammonia refrigeration systems.

Custom Content Section

Not applicable.

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UEESS00079 Refrigeration-Air Conditioning - Design Complex Carbon Dioxide Refrigeration Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

Not applicable.

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems
Note: Those holding any of the following qualifications from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of UEENEEJ165A and its pre-requisites.

- Diploma of Refrigeration and Air-conditioning Engineering
- Advanced Diploma of Refrigeration and Air-conditioning Engineering
- Advanced Diploma of Refrigeration and Air-conditioning - Technology
-

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Design complex carbon dioxide refrigeration systems

Custom Content Section

Not applicable.

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UEESS00080 Refrigeration-Air Conditioning - Design Hydrocarbon Refrigeration Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ132A Design commercial refrigeration systems and select components
UEENEEJ184A Apply safety awareness and legal requirements for carbon dioxide refrigerant
UEENEEJ187A Design carbon dioxide refrigerated systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems
Note: Those holding any of the following qualifications from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of UEENEEJ165A and its pre-requisites.

- Diploma of Refrigeration and Air-conditioning Engineering
- Advanced Diploma of Refrigeration and Air-conditioning Engineering
- Advanced Diploma of Refrigeration and Air-conditioning - Technology
-

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Design hydrocarbon refrigeration systems.

Custom Content Section

Not applicable.

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UEESS00081 Refrigeration-Air Conditioning - Design Secondary Refrigeration Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ132A	Design commercial refrigeration systems and select components
UEENEEJ183A	Design secondary refrigerant systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems
Note: Those holding any of the following qualifications from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of UEENEEJ165A and its pre-requisites.

- Diploma of Refrigeration and Air-conditioning Engineering
- Advanced Diploma of Refrigeration and Air-conditioning Engineering
- Advanced Diploma of Refrigeration and Air-conditioning - Technology
-

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Design secondary refrigeration systems.

Custom Content Section

Not applicable.

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UEESS00082 Refrigeration-Air Conditioning - Install and Commission Ammonia Refrigeration Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ178A Apply safety awareness and legal requirements for ammonia refrigerant
UEENEEJ179A Repair and service ammonia refrigeration systems
UEENEEJ180A Install and commission ammonia refrigeration systems, components and associated equipment

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:
UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components
AND
UEENEEJ113A Commission air conditioning and refrigeration systems
Note : Those holding a Certificate III in Refrigeration and Air Conditioning from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of these units and their pre-requisite requirements

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install and Commission Ammonia Refrigeration Systems

Custom Content Section

Not applicable.

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UEESS00083 Refrigeration-Air Conditioning - Install and Commission Carbon Dioxide Refrigeration Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ184A Apply safety awareness and legal requirements for carbon dioxide refrigerant
UEENEEJ185A Repair and service carbon dioxide refrigeration systems
UEENEEJ186A Install and commission carbon dioxide refrigeration systems, components and associated equipment

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:
UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components
AND
UEENEEJ113A Commission air conditioning and refrigeration systems
Note : Those holding a Certificate III in Refrigeration and Air Conditioning from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of these units and their pre-requisite requirements

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install and Commission Carbon Dioxide Refrigeration Systems

Custom Content Section

Not applicable.

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UEESS00084 Refrigeration-Air Conditioning - Install and Commission Hydrocarbon Refrigeration Systems, Major Components and Associated Equipment

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants
UEENEEJ175A Service and repair self contained hydrocarbon air conditioning and refrigeration systems
UEENEEJ176A Install and commission hydrocarbon refrigeration systems, components and associated equipment

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:
UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components
AND
UEENEEJ113A Commission air conditioning and refrigeration systems
Note : Those holding a Certificate III in Refrigeration and Air Conditioning from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of these units and their pre-requisite requirements

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Install and Commission Hydrocarbon Refrigeration Systems, Major Components and Associated Equipment

Custom Content Section

Not applicable.

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UEESS00085 Refrigeration-Air Conditioning - Operate Ammonia Refrigeration Plant

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant
UEENEEJ196A	Operate Ammonia Refrigeration Plant

Target Group

It is essential that anyone undertaking this skill set have access to an Ammonia refrigeration plant to complete the required activities and assessment in the workplace.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements to Operate Ammonia Refrigeration Systems

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Custom Content Section

Not applicable.

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UEESS00086 Refrigeration-Air Conditioning - Service and Repair Ammonia Refrigeration Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant
UEENEEJ179A	Repair and service ammonia refrigeration systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:
UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components
AND
UEENEEJ113A Commission air conditioning and refrigeration systems
Note : Those holding a Certificate III in Refrigeration and Air Conditioning from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of these units and their pre-requisite requirements

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Service and Repair Ammonia Refrigeration Systems

Custom Content Section

Not applicable.

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UEESS00087 Refrigeration-Air Conditioning - Service and Repair Carbon Dioxide Refrigeration and Heat Pump Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ184A Apply safety awareness and legal requirements for carbon dioxide refrigerant
UEENEEJ188A Repair and service self contained carbon dioxide refrigeration and heat pump systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components
or
UEENEEJ155A Service refrigeration appliances
Note : 1. Those holding a Certificate III in Refrigeration and Air-conditioning from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of UEENEEJ111A and its pre-requisite requirements
2. Those holding a Certificate III in Appliance Servicing from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of UEENEEJ155A and its pre-requisite requirements

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Service and Repair Carbon Dioxide Refrigeration and Heat Pump Systems

Custom Content Section

Not applicable.

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UEESS00088 Refrigeration-Air Conditioning - Service and Repair Carbon Dioxide Refrigeration Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ184A Apply safety awareness and legal requirements for carbon dioxide refrigerant
UEENEEJ185A Repair and service carbon dioxide refrigeration systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:
UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components
AND
UEENEEJ113A Commission air conditioning and air conditioning systems
Note : Those holding a Certificate III in Refrigeration and Air Conditioning from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of these units and their pre-requisite requirements

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Service and Repair Carbon Dioxide Refrigeration Systems

Custom Content Section

Not applicable.

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UEESS00089 Refrigeration-Air Conditioning - Service and Repair Hydrocarbon Refrigeration and Air Conditioning Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants
UEENEEJ175A Service and repair self contained hydrocarbon air conditioning and refrigeration systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components
or
UEENEEJ155A Service refrigeration appliances
Notes : 1. Those holding a Certificate III in Refrigeration and Air-conditioning from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of UEENEEJ111A and its pre-requisite requirements
2. Those holding a Certificate III in Appliance Servicing from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of UEENEEJ155A and its pre-requisite requirements

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Service and Repair Hydrocarbon Refrigeration and Air Conditioning Systems.

Custom Content Section

Not applicable.

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UEESS00090 Refrigeration-Air Conditioning - Service and Repair Secondary Refrigeration Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEJ182A Repair and service secondary refrigeration systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:
UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components
AND
UEENEEJ113A Commission air conditioning and refrigeration systems
Note : Those holding a Certificate III in Refrigeration and Air Conditioning from the UEE11 Electrotechnology Training Package, or equivalent, meet the requirements of these units and their pre-requisite requirements

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Service and repair secondary refrigeration systems

Custom Content Section

Not applicable.

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UEESS00091 Restricted - Attachment of cords and plugs to single phase low voltage electrical equipment

Modification History

Not applicable.

Description

This skill set is designed for people wishing to attach flexible cords and plugs for voltages operating to 250 volts. These competencies are in addition to competencies already gained in the relevant field to which the electrical work is incidental or a primary and regular function of the work. Learners will be developing skills in working safely on electrical cords and plugs, selecting and using testing and measuring devices; terminating and connecting cords and plugs to Australian Standards; safety testing and reporting on electrical cords and plugs.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant CII, CIII and CIV qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

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Licensing/Regulatory Information

Restricted Electrical Licence or Disconnected/Reconnected Electrical Licence – please refer to your local licensing body for details concerning the jurisdictional conditions and requirements for the issue of a license.

Skill Set Requirements

UEENEEE101A – Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP024A – Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply.

Target Group

The units of competency in this skill set are for people holding a relevant electrotechnology qualification at a CII or higher and the work is incidental or a primary and regular function of work related to a principle work function.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Restricted Electrical Licence - Attachment of cords and plugs to single phase low voltage electrical equipment.

Custom Content Section

Not applicable.

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UEESS00092 Restricted - Attachment of cords/cables and plugs to low voltage three phase electrical equipment

Modification History

Not applicable.

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Description

This skill set is designed for people wishing to attach flexible cords/cables and plugs for voltages operating up to 1000 V a.c. These competencies are in addition to competencies already gained in the relevant field to which the electrical work is incidental or a primary and regular function of the work. Learners will be developing skills in working safely on electrical cords and plugs, select and use testing and measuring devices; terminate and connect cords and plugs to Australian Standards; safety test and report on electrical cords and plugs.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant CII, CIII and CIV qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Restricted Electrical Licence or Disconnected/Reconnected Electrical Licence – please refer to your local licensing body for details concerning the jurisdictional conditions and requirements for the issue of a license.

Skill Set Requirements

UEENEEE101A – Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP024A – Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A – Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Target Group

The units of competency in this skill set are for people holding a relevant electrotechnology qualification at a CII or higher and the work is incidental or a primary and regular function of work related to a principle work function.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Restricted Electrical Licence - Attachment of cords/cables and plugs to low voltage three phase electrical equipment

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Custom Content Section

Not applicable.

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UEESS00093 Restricted - Disconnection/reconnection of fixed wired low voltage appliances

Modification History

Not applicable.

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Description

This skill set is designed for people wishing to disconnect and reconnect low voltage fixed wired appliances which are incidental or a primary and regular function of work related to a principle work function. Learners will be developing skills in isolation of low voltage electrical supplies, disconnection and reconnection of electrical appliances. More specifically, competent persons should be able to: work safely on electrical appliances, identifying supply arrangements; follow isolation procedure; select and use testing and measuring devices; terminate and connect cables and conductors to Australian Standards; safety test and report on electrical appliances.

This EXCLUDES disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, light etc); or installation of or alteration to any part of the fixed electrical wiring system (defined in applicable regulations as electrical installing work).

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant CIII and CIV qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Restricted Electrical Licence or Disconnected/Reconnected Electrical Licence – please refer to your local licensing body for details concerning the jurisdictional conditions and requirements for the issue of a license.

Skill Set Requirements

UEENEEE101A – Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP010A – Disconnect - reconnect appliances connected to low voltage installation wiring

Target Group

The units of competency in this skill set are for people holding a relevant CIII or equivalent in the areas of Refrigeration and Air Conditioning, Assembly and Servicing White Goods, Domestic Appliances and Equipment and the work is incidental or a primary and regular function of work related to a principle work function.

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Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Restricted Electrical Licence - Disconnection/ reconnection of fixed wired low voltage appliances.

Custom Content Section

Not applicable.

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UEESS00094 Restricted - Disconnection/reconnection of fixed wired low voltage control devices

Modification History

Not applicable.

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Description

This skill set is designed for people wishing to disconnect and reconnect low voltage fixed wired control devices which are incidental or a primary and regular function of work related to a principle work function. Learners will be developing skills in isolation of low voltage electrical supplies, disconnection and reconnection of control devices. More specifically, should be able to: work safely on control devices, identifying supply arrangements; follow isolation procedure; select and use testing and measuring devices; terminate and connect cables and conductors to Australian Standards; safety test and report on control devices.

This EXCLUDES disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, light etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant CIII and CIV qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Restricted Electrical Licence or Disconnected/Reconnected Electrical Licence – please refer to your local licensing body for details concerning the jurisdictional conditions and requirements for the issue of a license.

Skill Set Requirements

UEENEEE101A – Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP013A – Disconnect - reconnect control devices connected to low voltage installation wiring

Target Group

The units of competency in this skill set are for people holding a relevant CIII or equivalent in the areas of Instrumentation and control, Electronics and communications and the work is incidental or a primary and regular function of work related to a principle work function.

Suggested words for Statement of Attainment

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This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Restricted Electrical Licence - Disconnection/ reconnection of fixed wired low voltage control devices

Custom Content Section

Not applicable.

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UEESS00095 Restricted - Disconnection/reconnection of fixed wired low voltage motors

Modification History

Not applicable.

Description

This skill set is designed for people wishing to disconnect and reconnect low voltage fixed wired motors which are incidental or a primary and regular function of work related to a principle work function. Learners will be developing skills in isolation of low voltage electrical supplies, disconnection and reconnection of motors. More specifically, should be able to: work safely on motors, identifying supply arrangements; follow isolation procedure; select and use testing and measuring devices; terminate and connect cables and conductors to Australian Standards; safety test and report on motors.

This EXCLUDES disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, light etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).

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Pathways Information

The units of competency in this skill set will contribute to the completion of relevant CIII and CIV qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Restricted Electrical Licence or Disconnected/Reconnected Electrical Licence – please refer to your local licensing body for details concerning the jurisdictional conditions and requirements for the issue of a license.

Skill Set Requirements

UEENEEE101A – Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP015A – Disconnect - reconnect motors connected to low voltage installation wiring

Target Group

The units of competency in this skill set are for people holding a relevant CIII or equivalent in the areas of Refrigeration and Air Conditioning, Assembly and Servicing White Goods, Appliances repairs and mechanical fitting and the work is incidental or a primary and regular function of work related to a principle work function.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Restricted Electrical Licence - Disconnection/ reconnection of fixed wired low voltage motors

Custom Content Section

Not applicable.

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UEESS00096 Restricted - Disconnection/reconnection of fixed wired low voltage water heaters

Modification History

Not applicable.

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Description

This skill set is designed for people wishing to disconnect and reconnect low voltage fixed wired water heaters which are incidental or a primary and regular function of work related to a principle work function. Learners will be developing skills in isolation of low voltage electrical supplies, disconnection and reconnection of water heaters. More specifically, should be able to: work safely on water heaters, identifying supply arrangements; follow isolation procedure; select and use testing and measuring devices; terminate and connect cables and conductors to Australian Standards; safety test and report on water heaters.

This EXCLUDES disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, light etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant CIII and CIV qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Restricted Electrical Licence or Disconnected/Reconnected Electrical Licence – please refer to your local licensing body for details concerning the jurisdictional conditions and requirements for the issue of a license.

Skill Set Requirements

UEENEEE101A – Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP014A – Disconnect - reconnect water heaters connected to low voltage installation wiring

Target Group

The units of competency in this skill set are for people holding a relevant CIII or equivalent in the areas of Plumbing and gas fitting and the work is incidental or a primary and regular function of work related to a principle work function.

Suggested words for Statement of Attainment

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This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Restricted Electrical Licence - Disconnection/ reconnection of fixed wired low voltage water heaters

Custom Content Section

Not applicable.

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UEESS00097 Restricted - Disconnection/reconnection of fixed wired low voltage composite appliances

Modification History

Not applicable.

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Description

This skill set is designed for people wishing to disconnect and reconnect low voltage fixed wired composite appliances which are incidental or a primary and regular function of work related to a principle work function. Learners will be developing skills in isolation of low voltage electrical supplies, disconnection and reconnection of composite appliances. More specifically, should be able to: work safely on composite appliances, identifying supply arrangements; follow isolation procedure; select and use testing and measuring devices; terminate and connect cables and conductors to Australian Standards; safety test and report on composite appliances.

This EXCLUDES disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, light etc); or installation of or alteration to any part of the fixed electrical wiring system (defined in applicable regulations as electrical installing work).

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant CIII and CIV qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Restricted Electrical Licence or Disconnected/Reconnected Electrical Licence – please refer to your local licensing body for details concerning the jurisdictional conditions and requirements for the issue of a license.

Skill Set Requirements

UEENEEE101A – Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP012A – Disconnect / reconnect composite appliances connected to low voltage installation wiring

Target Group

The units of competency in this skill set are for people holding a relevant CIII or equivalent in the areas of Refrigeration and Air Conditioning, and the work is incidental or a primary and regular function of work related to a principle work function.

Suggested words for Statement of Attainment

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This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Restricted Electrical Licence - Disconnection/ reconnection of fixed wired low voltage composite appliances

Custom Content Section

Not applicable.

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UEESS00098 Restricted - Electrical safety testing of electrical cord connected equipment and cord assemblies

Modification History

Not applicable.

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Description

This skill set is designed for people wishing to undertake the testing, tagging and reporting of portable/ hand held low voltage electrical equipment using a portable appliance tester (PAT). These competencies are in addition to competencies already gained in the relevant field to which the electrical work is incidental or a primary and regular function of the work. Learners will be developing skills in working safely on portable/hand held electrical equipment, using the portable appliance tester, testing electrical equipment as per Australian Standard AS/NZS 3760.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant CII, CIII and CIV qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Please refer to your local workplace health and safety regulating authority for details concerning the jurisdictional conditions and requirements for people undertaking this type of work.

Skill Set Requirements

UEENEEE101A – Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP026A – Conduct in-service safety testing of electrical cord connected equipment and cord assemblies

Target Group

The units of competency in this skill set are for people required to ensure the safety of portable equipment and the work is incidental or a primary and regular function of work related to a principle work function.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Electrical safety testing of electrical cord connected equipment and cord assemblies

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Custom Content Section

Not applicable.

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UEESS00100 Sustainable - Designer of Grid Connected Photovoltaic Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE103A Solve problems in ELV single path circuits
UEENEEE104A Solve problems in d.c. circuits
UEENEEE105A Fix and secure electrotechnology equipment
UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A Lay wiring_cabling and terminate accessories for extra-low voltage (ELV) circuits
UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEK125A Solve basic problems in photovoltaic energy apparatus and systems

UEENEEK135A Design grid connected photovoltaic power supply systems

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Target Group

It is essential that anyone undertaking this skill set already holds a degree in Electrical Engineering, an Advanced Diploma or Diploma of Electrical Engineering or a trade qualification in the electrical trades.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Designer of Grid Connected Photovoltaic Systems

Custom Content Section

Not applicable.

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UEESS00101 Sustainable - Designer-Installer of Grid Connected Photovoltaic Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEG171A Install, set up and commission interval metering
UEENEEK125A Solve basic problems in photovoltaic energy apparatus and systems
UEENEEK135A Design grid connected photovoltaic power supply systems
UEENEEK148A Install, configure and commission LV grid connected photovoltaic power systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Designer/Installer of Grid Connected Photovoltaic Systems.

Custom Content Section

Not applicable.

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UEESS00102 Sustainable - Energy assessment of commercial facilities

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEK152A	Develop strategies to address sustainability issues for electrical installations
UEENEEK153A	Assess energy loads and uses for energy efficiency in residential, office and retail premises
UEENEEK154A	Assess energy loads and uses for energy efficiency in commercial facilities

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Energy assessment of commercial facilities

Custom Content Section

Not applicable.

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UEESS00103 Sustainable - Energy Assessment of industrial properties and enterprises

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEK152A Develop strategies to address sustainability issues for electrical installations
UEENEEK153A Assess energy loads and uses for energy efficiency in residential, office and retail premises
UEENEEK155A Assess energy loads and uses for energy efficiency in industrial properties and enterprises

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Energy assessment of industrial properties and enterprises

Custom Content Section

Not applicable.

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UEESS00104 Sustainable - Energy assessment of residential, office and retail premises

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEK152A Develop strategies to address sustainability issues for electrical installations
UEENEEK153A Assess energy loads and uses for energy efficiency in residential, office and retail premises

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Energy assessment of residential, office and retail premises

Custom Content Section

Not applicable.

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UEESS00105 Sustainable - Energy Efficiency Auditor

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE117A Implement and monitor energy sector OHS policies and procedures
UEENEEE124A Compile and produce an energy sector detailed report
UEENEEK142A Apply environmentally and sustainable procedures in the energy sector
UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures

Target Group

It is essential that anyone undertaking this skill set already holds a degree in Electrical Engineering, an Advanced Diploma or Diploma of Electrical Engineering or an electrical trade qualification from the Electrotechnology Training Package or equivalent.

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Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for an Energy Efficiency Auditor

Custom Content Section

Not applicable.

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UEESS00106 Sustainable - Energy Efficiency Systems Designer

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE078B Contribute to risk management in electrotechnology systems
UEENEEE129A Solve electrotechnical engineering problems
UEENEEG131A Evaluate performance of low voltage electrical apparatus
UEENEEK146A Design energy management controls for electrical installations in buildings

Target Group

It is essential that anyone undertaking this skill set already holds a degree in Electrical Engineering, an Advanced Diploma or Diploma of Electrical Engineering or an electrical trade qualification from the Electrotechnology Training Package or equivalent.

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Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for a Designer of Energy Efficient Systems

Custom Content Section

Not applicable.

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UEESS00107 Sustainable - Energy Efficiency Systems Developer

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE078B	Contribute to risk management in electrotechnology systems
UEENEEE124A	Compile and produce an energy sector detailed report
UEENEEE129A	Solve electrotechnical engineering problems
UEENEEG131A	Evaluate performance of low voltage electrical apparatus
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector
UEENEEK146A	Design energy management controls for electrical installations in buildings
UEENEEK151A	Develop effective engineering strategies for energy reduction in buildings

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Target Group

It is essential that anyone undertaking this skill set already holds a degree in Electrical Engineering, an Advanced Diploma or Diploma of Electrical Engineering or an electrical trade qualification from the Electrotechnology Training Package or equivalent.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for an Energy Efficiency Systems Developer

Custom Content Section

Not applicable.

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UEESS00108 Sustainable - Energy Efficiency Systems Integration

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE078B Contribute to risk management in electrotechnology systems
UEENEEG170A Plan large electrical projects
UEENEEI140A Plan the electrical installation of integrated systems
UEENEEI141A Develop electrical integrated systems
UEENEEI142A Develop an electrical integrated system interface for access through a touch screen
UEENEEI143A Develop access control of electrical integrated systems using logic-based programming tools
UEENEEI144A Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Units:

UEENEED101A Use computer applications relevant to a workplace
And
UEENEEG106A Terminate cables, cords and accessories for low voltage circuits
Or
UEENEEE108A Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Energy Efficiency Systems Integration

Custom Content Section

Not applicable.

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UEESS00109 Sustainable - Identify Energy Efficiency Strategies

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE078B Contribute to risk management in electrotechnology systems
UEENEEE124A Compile and produce an energy sector detailed report
UEENEEK132A Develop strategies to address environmental and sustainability issues in the energy sector
UEENEEK151A Develop effective engineering strategies for energy reduction in buildings

Target Group

It is essential that anyone undertaking this skill set already holds a degree in Electrical Engineering, an Advanced Diploma or Diploma of Electrical Engineering or an electrical trade qualification from the Electrotechnology Training Package or equivalent.

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Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements to Identify of Energy Efficiency Strategies

Custom Content Section

Not applicable.

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UEESS00110 Sustainable - Installer of Grid Connected Photovoltaic Systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Mapped skill set requirements	

Description

Not applicable.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package.
Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEG171A Install, set up and commission interval metering
UEENEEK125A Solve basic problems in photovoltaic energy apparatus and systems
UEENEEK148A Install, configure and commission LV grid connected photovoltaic power systems

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Installer of Grid Connected Photovoltaic Systems.

Custom Content Section

Not applicable.

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UEESS00113 Hazardous Areas - Electrical equipment in dust atmospheres

Modification History

Not applicable.

Description

This Skill Set covers the explosion-protection aspects for dust atmospheres of installing, maintaining, testing inspecting and attending to breakdowns of explosion-protected and associated equipment. It requires the ability to follow specifications, standards and work programs, work safely and complete the necessary documentation.
This Skill Set is directly equivalent to Unit 2.3 Attend to breakdowns in hazardous areas, Unit 2.5 Install Explosion-Protected equipment and wiring systems, Unit 2.7 Maintain equipment in hazardous areas, Unit 2.10 Conduct testing of hazardous areas installations, Unit 2.12 Conduct detailed inspection of hazardous areas installations and Unit 2.2 Report on the integrity of explosion-protected equipment in hazardous areas in the Australian/New Zealand Standard AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this Skill Set.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

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Licensing/Regulatory Information

The skills and knowledge described in this skill set are subject to regulatory requirements including applicable WHS/OHS and Electrical regulations and compliance with applicable Australian Standards.
Where plant and equipment operate at voltages above 50 V a.c. or 120 V d.c. a license to practice in the workplace is required.
Subject to applicable regulations including relevant WHS/OHS regulations, in some jurisdictions, a license to practice may be required to carry at work at extra low voltage.
Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations.
Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Skill Set Requirements

UEENEEM021A	Attend to breakdowns in hazardous areas - dust atmospheres
UEENEEM025A	Install explosion-protected equipment and wiring systems - dust atmospheres
UEENEEM029A	Maintain equipment in hazardous areas - dust atmospheres
UEENEEM040A	Conduct testing of hazardous areas installations - dust atmospheres
UEENEEM045A	Conduct detailed inspection of hazardous areas installations - dust atmospheres
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

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Target Group

Those undertaking this skill set should hold:

Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 3 or equivalent.
or
Competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF level 3 or equivalent.
or
Competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent.
or
Competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Hazardous Areas – Electrical equipment in dust atmospheres

Custom Content Section

Not applicable.

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UEESS00114 Hazardous Areas - Electrical equipment in gas atmospheres

Modification History

Not applicable.

Description

This Skill Set covers the explosion-protection aspects for gas atmospheres of installing, maintaining, testing inspecting and attending to breakdowns of explosion-protected and associated equipment. It requires the ability to follow specifications, standards and work programs, work safely and complete the necessary documentation.
This Skill Set is directly equivalent to Unit 2.3 Attend to breakdowns in hazardous areas, Unit 2.5 Install Explosion-Protected equipment and wiring systems, Unit 2.7 Maintain equipment in hazardous areas, Unit 2.10 Conduct testing of hazardous areas installations, Unit 2.12 Conduct detailed inspection of hazardous areas installations and Unit 2.2 Report on the integrity of explosion-protected equipment in hazardous areas in the Australian/New Zealand Standard AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this Skill Set.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice

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Licensing/Regulatory Information

The skills and knowledge described in this skill set are subject to regulatory requirements including applicable WHS/OHS and Electrical regulations and compliance with applicable Australian Standards.
Where plant and equipment operate at voltages above 50 V a.c. or 120 V d.c. a license to practice in the workplace is required.
Subject to applicable regulations including relevant WHS/OHS regulations, in some jurisdictions, a license to practice may be required to carry at work at extra low voltage.
Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations.
Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Skill Set Requirements

UEENEEM020A	Attend to breakdowns in hazardous areas – gas atmospheres
UEENEEM024A	Install explosion-protected equipment and wiring systems - gas atmospheres
UEENEEM028A	Maintain equipment in hazardous areas - gas atmospheres
UEENEEM039A	Conduct testing of hazardous areas installations – gas atmospheres
UEENEEM044A	Conduct detailed inspection of hazardous areas installations — gas atmospheres
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

Target Group

Those undertaking this skill set should hold:
Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 3 or equivalent.
or

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Competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF level 3 or equivalent.
or
Competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent.
or
Competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Hazardous Areas – Electrical equipment in gas atmospheres

Custom Content Section

Not applicable.

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UEESS00115 Hazardous Areas – Electrical equipment in hazardous areas - pressurisation

Modification History

Not applicable.

Description

This Skill Set covers the explosion-protection aspects for pressurised atmospheres of installing, maintaining, testing inspecting and attending to breakdowns of explosion-protected and associated equipment. It requires the ability to follow specifications, standards and work programs, work safely and complete the necessary documentation.
This Skill Set is directly equivalent to Unit 2.3 Attend to breakdowns in hazardous areas, Unit 2.5 Install Explosion-Protected equipment and wiring systems, Unit 2.7 Maintain equipment in hazardous areas, Unit 2.10 Conduct testing of hazardous areas installations, Unit 2.12 Conduct detailed inspection of hazardous areas installations and Unit 2.2 Report on the integrity of explosion-protected equipment in hazardous areas in the Australian/New Zealand Standard AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this Skill Set.

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Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

The skills and knowledge described in this skill set are subject to regulatory requirements including applicable WHS/OHS and Electrical regulations and compliance with applicable Australian Standards.
Where plant and equipment operate at voltages above 50 V a.c. or 120 V d.c. a license to practice in the workplace is required.
Subject to applicable regulations including relevant WHS/OHS regulations, in some jurisdictions, a license to practice may be required to carry at work at extra low voltage.
Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations.
Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Skill Set Requirements

UEENEEM022A	Attend to breakdowns in hazardous areas — pressurisation
UEENEEM026A	Install explosion-protected equipment and wiring systems — pressurisation
UEENEEM030A	Maintain equipment in hazardous areas — pressurisation
UEENEEM041A	Conduct testing of hazardous areas installations — pressurisation
UEENEEM046A	Conduct detailed inspection of hazardous areas installations — pressurisation
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

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Target Group

Those undertaking this skill set should hold:
Competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 3 or equivalent.
or
Competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF level 3 or equivalent.
or
Competencies in installation of general low-voltage or extra-low voltage electrical /electronic equipment and wiring systems at AQF 3 or equivalent.
or
Competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Hazardous Areas – Electrical equipment in hazardous areas – pressurisation

Custom Content Section

Not applicable.

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UEESS00116 Data Communications - Premises Cabling for NBN Rollout

Modification History

Not applicable.

Description

This skill set covers the installation and modification of high performance data communication cabling in buildings and premises and intended for connection a telecommunications network.

The skill set encompasses working safely and to standard and specifications installing multiple data lines and backbones using structured twisted pair cabling, terminating at distributors, termination modules and in socket outlets, testing and compliance checks, preparing and filling trenches, placing conduits and ducts, drawing cables, installing catenary cable, fixing communication cables, installing multiple data lines and backbones using optical fibre cabling, terminating at distributors, splices and on socket outlets, testing and compliance checks and completing necessary documentation.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

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Skill Set Requirements

UEENEEF104A	Install and modify performance data communication copper cabling
UEENEEF105A	Install and modify optical fibre performance data communication cabling
UEENEEF112A	Install aerial telecommunication cables
UEENEEF113A	Install underground communication cables

Target Group

It is essential that anyone undertaking this skill set must already hold:
ACMA Open Cabling Registration
Note:
This Skill Set meets the ACMA Industry Recognised Endorsements for Optical Fibre, Structured Cable, Underground Cabling and Overhead Cabling.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Premises cabling for NBN Rollout

Custom Content Section

Not applicable.

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UEESS00117 Hazardous Areas - Design and Classification

Modification History

Not applicable.

Description

This unit covers the explosion-protection aspects of designing electrical power, control and instrumentation systems and installations. It requires the ability to identify hazardous area zones from classification diagrams, or from examples of previously classified areas or those given in Standards, and to select and locate explosion-protected equipment and wiring systems and other items that may influence the explosion-protection technique, classify areas where flammable/combustible potentially explosive materials may exist. It requires the ability to gather and analyse data relative to explosion hazards, determine the extent of risk and establish and document zones and establish design briefs and to pursue economical and effective design solutions

This Skill Set is directly equivalent to the Units 2.16 Classify hazardous areas, 2.17 Plan electrical installations for hazardous areas and 2.18 Design explosion-protected electrical systems and installations in the Australian/New Zealand Standard AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

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Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEM052A Classify hazardous areas - gas atmospheres

UEENEEM053A Classify hazardous areas - dust atmospheres

UEENEEM054A Plan electrical installations for hazardous areas - gas atmospheres

UEENEEM055A Plan electrical installations for hazardous areas - dust atmospheres

UEENEEM057A Design explosion-protected electrical systems and installations - gas atmospheres

UEENEEM058A Design explosion-protected electrical systems and installations - dust atmospheres

Target Group

Competencies in gathering and analysing technical data at AQF6 or equivalent

Competencies in designing electrical systems and installations at AQF level 6 or equivalent

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Hazardous Areas – Design and Classification

Custom Content Section

Not applicable.

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UEESS00118 Data Communications - Plan an integrated cabling installation system

Modification History

Not Applicable

Description

This skill set covers planning of cable routes for intelligent power and lighting, information and communications, entertainment systems, distributed video and audio; energy management and control; security and safety; digital home health; age and assisted living;.. This unit encompasses determining immediate and future cabling needs of an installation and their origins and termination points, planning cable routes, specifying cable types, sizes, fixing/support methods and cable identification systems and documenting cabling plans based on calculated and/or deemed-to-comply solutions as well as the planning of the wiring hub if required.

The skill set encompasses working safely and to standard and specifications and completing necessary documentation.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE121A	Plan an integrated cabling installation system
UEENEEE108A	Lay wiring_cabling and terminate accessories for extra-low voltage (ELV) circuits

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Target Group

It is essential that anyone undertaking this skill set must already hold:
ACMA Open Cabling Registration.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Plan an integrated cabling installation system

Custom Content Section

Not applicable.

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UEESS00119 Data Communications - Test, report and rectify faults in data and voice installations

Modification History

Not applicable.

Description

This skill set covers testing for certification finding and repairing faults in telecommunication installations and local area networks. The unit encompasses working safely, reading cabling diagrams, performance testing, applying logical fault finding procedures, testing functionality of the network, conducting repairs and completing the necessary documentation

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEF111A	Test, report and rectify faults in data and voice installations

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Target Group

It is essential that anyone undertaking this skill set must already hold:
ACMA Open Cabling Registration and Nationally Recognised Endorsements for Structured Cable and Optical Fibre.
Note:
This Skill Set meets the ACMA Industry Recognised Endorsement for Testing

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Plan an integrated cabling installation system

Custom Content Section

Not applicable.

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UEESS00120 Data Communications - Plan an integrated cabling installation system - Electricians

Modification History

Not applicable.

Description

This skill set covers planning of cable routes for intelligent power and lighting, information and communications, entertainment systems, distributed video and audio; energy management and control; security and safety; digital home health; age and assisted living;. This unit encompasses determining immediate and future cabling needs of an installation and their origins and termination points, planning cable routes, specifying cable types, sizes, fixing/support methods and cable identification systems and documenting cabling plans based on calculated and/or deemed-to-comply solutions as well as the planning of the wiring hub if required.

The skill set encompasses working safely and to standard and specifications and completing necessary documentation

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE121A	Plan an integrated cabling installation system
UEENEEE108A	Lay wiring_cabling and terminate accessories for extra-low voltage (ELV) circuits

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Target Group

It is essential that anyone undertaking this skill set must already hold:
ACMA Open Cabling Registration or an Electrician's Licence.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Plan an integrated cabling installation system

Custom Content Section

Not applicable.

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UEESS00121 Hazardous Areas - Inspect, repair and test reeling, trailing and flexible cables

Modification History

Not applicable.

Description

The inspection and repair of reeling, trailing and flexible cables supplying equipment used in the quarries, open cut and underground mines is subject to the compliance with applicable Australian and New Zealand Standards and applicable legislation/regulation including but not limited to:

AS/NZS 1747 Reeling, trailing and feeder cables used in mining-Repair, testing and fitting of accessories
AS/NZS 1802 Electric cables - Reeling and trailing - For underground coal mining purposes
AS/NZS 1972 Electric cables - Underground coal mines - Other than reeling and trailing
AS/NZS 2802 Electric cables - Reeling and trailing for mining and general use (other than underground coal mining)
AS/NZS 4761.1.2008, Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1 – Competency standards;
AS/NZS 4761.2.2008, Competencies for working with electrical equipment in hazardous areas (EEHA) Part 2 – Guide to assessing competency;

This Skill Set has been developed to allow industry to provide training to its operatives to ensure compliance.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

This Skill Set meets the competency and AS/NZS Standards compliance requirements in accordance with regulations for the registration of a Licenced Cable Repairer or equivalent under applicable jurisdictional legislation and/or regulation.

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Skill Set Requirements

UEENEEM070A	Repair reeling, trailing and flexible cables
UEENEEM071A	Test reeling, trailing and flexible cables
UEENEEM072A	Inspect and fit plugs/couplers for reeling, trailing and flexible cables

Target Group

Persons undertaking this Skill Set shall be employed by a Cable Repairer registered under applicable jurisdictional regulation.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Inspect, repair and test reeling, trailing and flexible cables – Operatives.

Custom Content Section

Not applicable.

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UEESS00122 Hazardous Areas - Verifying compliance of repaired reeling, trailing and flexible cable

Modification History

Not applicable.

Description

The testing and verification of compliance of reeling, trailing and flexible cables supplying equipment used in the quarries, open cut and underground mines is subject to the compliance with applicable Australian and New Zealand Standards and applicable legislation/regulation including but not limited to:

AS/NZS 1747 Reeling, trailing and feeder cables used in mining-Repair, testing and fitting of accessories
AS/NZS 1802 Electric cables - Reeling and trailing - For underground coal mining purposes
AS/NZS 1972 Electric cables - Underground coal mines - Other than reeling and trailing
AS/NZS 2802 Electric cables - Reeling and trailing for mining and general use (other than underground coal mining)
AS/NZS 4761.1.2008, Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1 – Competency standards;
AS/NZS 4761.2.2008, Competencies for working with electrical equipment in hazardous areas (EEHA) Part 2 – Guide to assessing competency;

This Skill Set has been developed to allow industry to provide training to its operatives to ensure compliance.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate III, Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

This Skill Set meets the competency and AS/NZS Standards compliance requirements in accordance with regulations for the registration of a Licenced Cable Repairer or equivalent under applicable jurisdictional legislation and/or regulation

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Skill Set Requirements

UEENEEM073A	Verify compliance of repaired reeling, trailing and flexible cables

Target Group

Persons undertaking this Skill Set shall be employed by a Cable Repairer registered under applicable jurisdictional regulation.

They shall hold the competencies:

UEENEEM070A	Repair reeling, trailing and flexible cables
UEENEEM071A	Test reeling, trailing and flexible cables
UEENEEM072A	Inspect and fit plugs/couplers for reeling, trailing and flexible cables

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Testing and verifying compliance of reeling, trailing and flexible cables

Custom Content Section

Not applicable.

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UEESS00123 Sustainable - Electrical Installations Sustainability Strategies

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Mapped Skill Set Requirements	

Description

This skill set covers developing strategies to address greenhouse gases and sustainability issues for residential, commercial and industrial electrical installations. It encompasses working safely, apply extensive knowledge of electrical installations and components and their operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting alternatives solutions

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

The skills and knowledge described in this skill set require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

Skill Set Requirements

UEENEEK152A	Develop strategies to address sustainability issues for electrical installations

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Target Group

It is essential that anyone undertaking this skill set must already hold:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Electrical Installations Sustainability Strategies

Custom Content Section

Not applicable.

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UEESS00124 Instrumentation - Programmable control systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Mapped Skill Set Requirements	

Description

This skill set covers development, installation and testing of programs for programmable controllers (PLC) for a system requiring discrete control functions and industrial system requiring advance control functions. It encompasses working safely, applying knowledge of control systems, control system development methods, using ladder diagrams/statement list/function block diagram instruction sets, following written instructions and documenting program development and testing activities.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Certificate IV, Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Skill Set Requirements

UEENEEI150A Develop, enter and verify discrete control programs for programmable controllers

UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.

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Target Group

It is essential that anyone undertaking this skill set have the competency:
UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace.

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Instrumentation – Programmable control systems

Custom Content Section

Not applicable.

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UEESS00125 Electrical - Plan, Manage and Report on Electrical Projects

Modification History

Not applicable.

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Description

This skill set covers skills, knowledge and work performance requirements to allow qualified electricians to plan electrotechnology projects, apply occupational health and safety regulations, codes and practices in the workplace, compile and produce an energy sector detailed report, manage large electrical projects.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE013B	Plan Electro-technology Projects
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE124A	Compile and produce an energy sector detailed report
UEENEEG169A	Manage Large Electrical Projects

Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:

UEENEEG105A Verify compliance and functionality of low voltage general electrical installations

OR

A current unrestricted electrical licence issued in an Australian State or Territory.

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Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Plan, Manage and Report on Electrical Projects

Custom Content Section

Not applicable.

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UEESS00126 Electrical - Develop and Implement Maintenance Programs

Modification History

Not applicable.

Description

This skill set covers skills, knowledge and work performance requirements to allow qualified electricians to develop and implement energy sector maintenance programs and compile and produce an energy sector detailed report

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE110A	Develop and implement energy sector maintenance programs
UEENEEE124A	Compile and produce an energy sector detailed report

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Target Group

It is essential that anyone undertaking this skill set already holds the Competency Standard Unit:

UEENEEG105A Verify compliance and functionality of low voltage general electrical installations

OR

A current unrestricted electrical licence issued in an Australian State or Territory

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Develop and Implement Maintenance Programs

Custom Content Section

Not applicable.

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UEESS00127 Hazardous Areas - Design and Maintain Safe Hazardous Areas Installations - Coal Mining

Modification History

Not applicable.

Description

This skill set covers skills, knowledge and work performance requirements to allow qualified electricians to plan electrical installations with a low voltage demand up to 400 A per phase, install explosion-protected equipment and wiring systems, maintain equipment in hazardous areas, develop and manage maintenance programs for hazardous area electrical equipment, report on the integrity of explosion-protected equipment in a hazardous area, plan electrical installations in hazardous areas and manage compliance of hazardous areas in the coal mining industry.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements

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Skill Set Requirements

UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase
UEENEEM023A	Install explosion-protected equipment and wiring systems - coal mining
UEENEEM027A	Maintain equipment in hazardous areas - coal mining
UEENEEM047A	Develop and Manage Maintenance Programs for Hazardous Area Electrical Equipment - Coal Mining
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area
UEENEEM074A	Plan Electrical Installations in Hazardous Areas – Coal Mining
UEENEEM078A	Manage Compliance of Hazardous Areas

Target Group

It is essential that anyone undertaking this skill set is currently employed in the coal mining industry and holds the Competency Standard Unit:

UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Design and Maintain Safe Hazardous Areas Installations – Coal Mining

Custom Content Section

Not applicable.

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UEESS00128 Hazardous Areas - Classify, Audit and Report on Hazardous Areas - Coal Mining

Modification History

Not applicable.

Description

This skill set covers skills, knowledge and work performance requirements to allow qualified electricians to write specifications for electrical engineering projects, evaluate performance of low voltage electrical apparatus, classify hazardous areas, conduct audit of hazardous areas installations and report on the integrity of explosion-protected equipment in a hazardous area in the coal mining industry.

Pathways Information

The units of competency in this skill set will contribute to the completion of relevant Diploma and Advanced Diploma qualifications from the UEE11 Electrotechnology Training Package. Please consult the packaging rules of the relevant qualification for further advice.

Licensing/Regulatory Information

Readers should ensure that they have also read the part of the Training Package that outlines licensing and regulatory requirements.

Skill Set Requirements

UEENEEE071B	Write specifications for electrical engineering projects
UEENEEG131A	Evaluate performance of low voltage electrical apparatus
UEENEEM052A	Classify hazardous areas - gas atmospheres
UEENEEM064A	Conduct audit of hazardous areas installations - coal mining
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

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Target Group

It is essential that anyone undertaking this skill set is currently employed in the coal mining industry and holds the Competency Standard Unit:
UEENEEG105A Verify compliance and functionality of low voltage general electrical installations
OR
A current unrestricted electrical licence issued in an Australian State or Territory

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Design and Maintain Safe Hazardous Areas Installations – Coal Mining

Custom Content Section

Not applicable.

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UEESS00129 Apply currency of safe working practices and compliance verification of electrical installations

Modification History

Not applicable.

Description

This skill set covers current practices in working safely and verifying compliance of electrical installations that affect the currency of competencies held. It encompasses working safely, procedures for rescue from contact with live parts and for applying emergency first aid. It also encompasses current practices in visual inspections and mandatory compliance testing, identifying non-compliance defects and mandatory reporting requirements

Pathways Information

Not applicable.

This Skill Set has been designed to meet jurisdictional regulatory/ licencing currency requirements for holders of unrestricted electrical licences.
This Skill Set does not provide any articulation to any qualification or other competency standard unit

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Licensing/Regulatory Information

In the workplace: The application of the skills and knowledge described in this skill set require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

This Skill Set requirement is the unit UEENEEG197A Apply currency of safe working practices and compliance verification of electrical installations which is intended for electrical license holders who, as required by the relevant regulatory authority, must demonstrate currency in safe working, electrical rescue practices and compliance verification of electrical installations

As the purpose of this Skill Set is to provide for the demonstration of currency in technical skills, standards and OHS/WHS compliance, described in the unit, regulators require that candidates shall not be afforded Recognition of Prior Learning (RPL) and shall be required to undertake formal training and assessment to demonstrate competency in all aspects of the work of the unit.

Skill Set Requirements

UEENEEG197A - Apply currency of safe working practices and compliance verification of electrical installations

Target Group

This Skill Set is for:

Holders of ‘Unrestricted Electrician’s Licence’ or ‘Qualified Electrical Contracting Licence’ required by regulation to periodically undertake the unit UEENEEG197A Apply currency of safe working practices and compliance verification of electrical installations, to demonstrate currency in safe working, electrical rescue practices and compliance verification of electrical installations.

A ‘licensed electrician’ applying for an ‘electrical contractors licence’ may be required by regulation to undertake this unit to demonstrate their currency with verification of compliance requirements. In this case the candidate shall:

hold a current ‘Unrestricted Electrician’s Licence’ issued in an Australian State or Territory.

have recently been in permanent employment as a licensed electrician.

Suggested words for Statement of Attainment

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This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Apply currency of safe working practices and compliance verification of electrical installations

Custom Content Section

Not applicable.

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UEESS00130 Apply compliance requirements to all aspects of electrical work

Modification History

Not applicable.

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Description

This skill set covers competencies to apply WHS/OHS and electrical installation safety obligations of persons licensed to undertake electrical work. It encompasses WHS/OHS requirements for identifying hazards, establishing levels of risk mitigation control, following safe working methods, determining whether an electrical installation is compliant, dealing with installation defects and documenting activities and outcomes.

Pathways Information

Not applicable.

This Skill Set has been designed to meet jurisdictional regulatory/ licencing currency requirements for holders of unrestricted electrical licences.
This Skill Set does not provide any articulation to any qualification or other competency standard unit.

Licensing/Regulatory Information

In the workplace: The application of the skills and knowledge described in this skill set require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

This Skill Set requirement is UEENEEG198A - Apply compliance requirements to all aspects of electrical work, which is intended for electrical license holders who, according to the regulatory authority, have exhibited recalcitrance in their licence and/or WHS/OHS obligations.

As the purpose of this Skill Set is to address such recalcitrance, as described in the unit, to ensure deficits in electrical technical skills and compliance with applicable regulations, standards and/or WHS/OHS are fully addressed, regulators require that candidates shall not be afforded Recognition of Prior Learning (RPL) and shall be required to undertake formal training and assessment to demonstrate competency in all aspects of the work of the unit.

Skill Set Requirements

UEENEEG198A - Apply compliance requirements to all aspects of electrical work

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Target Group

This unit is intended for electrical license holders who, according to the regulatory authority, have exhibited recalcitrance in their licence and/or WHS/OHS obligations.

It may be called up by an electrical safety or WHS/OHS authority as a means of retraining of such license holders. Incompetence in not meeting required obligation could result from:

A competent person acting incompetently, or

A previously competent person failing to keep abreast of changes and developments in the WHS/OHS requirements and practices, the Wiring Rules and local service rules and related regulatory requirements.

As the purpose of this Skill Set is to address the deficiencies described above, the application of this unit requires that candidates shall not be afforded Recognition of Prior Learning (RPL) and must undertake training and assessment to demonstrate competency in all aspects of the work of the unit

Suggested words for Statement of Attainment

This Skill Set from the UEE11 Electrotechnology Training Package meets the industry requirements for Apply compliance requirements to all aspects of electrical work

Custom Content Section

Not applicable.

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UEENEEA101A Assemble electronic components

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fitting and inter connecting of electronic sub assemblies. It encompasses the safe use of hand tools, powered tools, identifying components, high reliability soldering, following set procedures and work instructions and keeping work records.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to assemble electronic components.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures for work preparation are followed
		1.3	Work instructions are obtained and understood
		1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others
		1.5	Materials required for work are obtained in accordance with established routines and procedures
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Assemble electronic components.	2.1	Established OHS risk control work measures are followed
		2.2	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.3	Interconnections are made to comply with industry/ enterprise standards.
		2.4	Work is completed in acceptable timeframe given environment and workplace conditions
3	Check quality of assembled components.	3.1	Established OHS risk control measures for work completion are followed
		3.2	Quality of assembled component is checked against enterprise/industry standards
		3.3	Prescribed solutions are used where corrective actions to assembled components are necessary

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and assembling electronic apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA101A Electronic component assembly

Evidence shall show an understanding of assembling electronic apparatus, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Identification of surface mount components

T2. Requirements of standard with respect to surface mount soldering

T3. Post solder inspection

T4. Ball grid arrays

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment

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intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

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Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble electronic apparatus as described in 8) and including:

A Following assembly instructions.

B Correctly selecting and placing components.

C Making connection without damaging components.

D Adhering to quality procedures.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling electronic apparatus.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

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UEENEEA102A	Select electronic components for assembly
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated by assembling at least two different electronic apparatus consisting of a chassis, printed circuit board, adjustment components and interconnections in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Assembly

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UEENEEA102A Select electronic components for assembly

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers identifying and selecting electronic components for assembly from job specifications. It encompasses working safely, interpreting job specifications, identifying components by colour code and markings and following quality procedures and work instructions.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to select electronic components.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	Work instructions are obtained and understood.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Materials required for the work are obtained in accordance with established routines and procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Select electronic components.	2.1	Established OHS risk control work measures are followed.
	2.2	Electronic components are selected, sorted and placed in accordance with work instructions and established routines.
	2.3	Prescribed solutions are used to resolve issues with supply of component.
	2.4	Routine quality checks are conducted to ensure components comply with enterprise / industry standards.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	Established OHS risk control measures for work completion are followed.
	3.2	Work report forms/data sheets on components are completed accurately.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and the selection of electronic components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA102A Electronic component basics and selection

Evidence shall show an understanding of selecting electronic components, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Types of components encompassing:

- resistors, inductors, capacitors, diodes, transistor, integrated circuits, printed circuit boards, sub-assemblies, and mounting/enclosing, connection and termination hardware.

T2. The physical features and primary characteristic of components encompassing:

- features include shape, size and connections
- characteristics include parameter and power ratings and polarity.
- methods of identifying and marking of component ratings.
- identifying and handling static sensitive components.
- selection of components

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Select electronic components as described in 8) and including:

A Following job specifications

B Identifying and selecting components

C Handling components without damaging them

D Adhering to quality procedures

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E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to the selection of electronic components.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEA 101A	Assemble electronic components
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated by selecting components for at least two different electronic apparatus consisting of a chassis, printed circuit board, adjustment components and interconnections in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Assembly

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UEENEEA103A Set up and check electronic component assembly machines

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the setting up of electronic circuit board assembly machines. It encompasses working safely, interpreting job specifications, identifying components by colour code and markings, following machine set-up routines and following quality procedures and work instructions.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEA101A Assemble electronic components

UEENEEA102A Select electronic components for assembly

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set-up machine.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	Work instructions are obtained and understood
	1.4	Advice is sought from the work supervisor to ensure that work is co-ordinated effectively with others
	1.5	Materials required for the work are obtained in accordance with established routines and procedures
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Set-up machine.	2.1	Established OHS risk control work measures are followed
	2.2	Machines are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Electronic components are selected, sorted and placed in accordance with work instructions and established routines
	2.4	Machine is set up in accordance with routine instructions ensuring specified components are loaded correctly
	2.5	Prescribed solutions are used to resolve issues

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ELEMENT	PERFORMANCE CRITERIA	
		with supply of component
	2.6	Routine quality checks are conducted to ensure components comply with enterprise/industry standards
	2.7	Work is completed in acceptable timeframe given environment and workplace conditions
3 Complete work report.	3.1	Established OHS risk control measures for work completion are followed.
	3.2	Operational checks of machine are carried out in accordance with established routines to ensure quality outcome are met
	3.3	Work report forms/data sheets on components are completed accurately

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and setting up and checking electronic component placement machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA103A Electronic component assembly placement machines

Evidence shall show an understanding of electronic component place equipment, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Process control requirements and procedures

T2. Solder paste composition encompassing:

- storage and shelf life
- preparation
- testing

T3. Solder paste deposition equipment encompassing:

- manual, setup and application
- automatic, setup and application

T4. Automatic component placement systems encompassing:

- set up
- operation
- adjustments

T5. Reflow ovens and solder reflow

T6. Cleaning agents and techniques

T7 Inspection methods and procedures

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set-up and check electronic component placement machines as described in 8) and including:

A Following assembly job specifications.

B Identifying components.

C Handling components without damaging them.

D Conducting machine operation checks.

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E	Adhering to quality procedures.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up and checking electronic component placement machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEA101A Assemble electronic components

UEENEEA102A Select electronic components for assembly

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated by setting up and checking electronic component assembly machines in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Assembly

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UEENEEA104A Modify electronic sub assemblies

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit.	

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers correcting and or modifying electronic sub assemblies. It encompasses working safely, high reliability de-soldering/soldering, checking components against job specifications, testing and following quality procedures.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.
Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Unit Code	Unit Title
Common Unit Group	
UEENEEA101A	Assemble electronic components
UEENEEA102A	Select electronic components for assembly
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
Electrotechnology Unit Pathway	
UEENEEE103A	Solve problems in ELV single path circuits
Electronics and Communications Unit Pathway	
UEENEEE104A	Solve problems in d.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading 3	Writing 3	Numeracy 3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to modify	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control measures for work preparation are followed
	1.3	The nature of the rework is determined from documentation or from work supervisor to establish the scope of work to be undertaken
	1.4	Rework of subassemblies is coordinated with others involved in the work to ensure work schedules are met and safety measures are followed
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures
	1.6	Tools and equipment required for rework are selected for their effectiveness and checked for correct operation and safety

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ELEMENT	PERFORMANCE CRITERIA	
2 Modify sub assemblies.	2.1	OHS risk control work measures and procedures are followed
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Components are de-connected and re-connected in accordance with principles and technology of connection methods used
	2.5	Work is carried out in compliance with quality procedures and enterprise/industry standards
	2.6	Rework of subassemblies is completed in acceptable timeframe and given environment and workplace conditions
3 Check quality of modified sub assemblies.	3.1	OHS risk control measures for work completion are followed
	3.2	Quality of rework is checked against enterprise/ industry standards
	3.3	Functional tests on reworked subassemblies are carried out in accordance with established routines
	3.4	Actions are taken to rectify defects within the scope of established routines
	3.5	Report forms/data sheets on rework of subassemblies are completed accurately

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and modifying/reworking electronic sub assemblies.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA104A Electronic sub assembly modification techniques

Evidence shall show an understanding of electronic sub assemblies modification techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Enterprise quality management system encompassing:

- purpose of a quality system
- procedures pertaining to the relevant work function
- work instructions pertaining to the relevant work function

T2. Printed wiring board substrate repair encompassing:

- warpage and cracking damage
  - blistering and delaminating

T3. Conductor patterns repair, including encompassing:

- pad repair and replacement
- track repair, alteration, replacement.

T4. Conformal coatings encompassing:

- types
- removal
- replacement

T5. Quality checks encompassing:

- enterprise/ industry standards
- functional tests
- report forms/data sheets

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Rework electronic sub assemblies as described in 8) and including:

A	Following job specifications
B	Using high reliability de-soldering/soldering techniques
C	Removing and placing components without damage

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D	Adhering to quality procedures
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to reworking electronic sub assemblies.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEA101A Assemble electronic components

UEENEEA102A Select electronic components for assembly

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated by modifying/reworking any electronic sub assembly in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Assembly

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UEENEEA105A Conduct quality and functional tests on assembled electronic apparatus

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit.	

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers setting up testing equipment, inspecting the quality and testing functionality of electronic apparatus. It encompasses working safely with electricity, testing device set-up, following testing and inspection procedures, interpreting and reporting testing and inspection results and making recommendations for dealing with defects.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.
Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Unit Code	Unit Title
Common Unit Group	
UEENEEA101A	Assemble electronic components
UEENEEA102A	Select electronic components for assembly
UEENEEA104A	Modify electronic sub assemblies
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
Electrotechnology Unit Pathway	
UEENEEE103A	Solve problems in ELV single path circuits
Electronics and Communications Unit Pathway	
UEENEEE104A	Solve problems in d.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and

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Numeracy'		
Reading 3	Writin g 3	Numeracy 3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct testing and inspection.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control measures for work preparation are followed
	1.3	Documented apparatus functions and quality requirements are identified, obtained and understood
	1.4	Testing processes and procedures are reviewed and testing equipment is checked for correct operation and safety
	1.5	Apparatus testing and inspection is coordinated with others involved in the work to ensure work schedules are met and safety measures are

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ELEMENT		PERFORMANCE CRITERIA	
			followed
2	Conduct apparatus tests.	2.1	OHS risk control work measures and procedures are followed
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Testing is conducted in accordance with principles and technology of electrical measurement
		2.5	Test results are interpreted within the scope of required functionality and quality
3	Conduct apparatus inspection.	3.1	OHS risk control work measures and procedures are followed
		3.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures
		3.3	Apparatus is inspected for compliance with quality/industry standards
		3.4	Work is completed in acceptable timeframe and given environment and workplace conditions
4	Report on apparatus testing and inspection.	4.1	Recommendations on repairs to defects are reported within the scope of established procedures
		4.2	Report forms/data sheets on testing and inspection are completed accurately

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices, conducting quality and functional tests on assembled electronic apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA105A Electronic assembly quality and functional testing techniques

Evidence shall show an understanding of electronic assembly quality and functional testing techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Test equipment encompassing:

- types
- operation
- setting up

Note. Testing equipment may be specific to a workplace and the electronic assembly under test

T2. Testing encompassing:

- requirements
- routine testing procedures
- check lists
- interpreting test results within given parameters

T3. Quality inspection encompassing:

- requirements
- routine testing procedures
- check lists
- interpreting test results within given parameters

T4. Non-compliance reporting encompassing:

- methods and procedures
- documentation

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct functional and quality tests on assembled electronic apparatus as described in 8) and including:

A Following job specifications.

B Selecting and using testing and measuring device correctly.

C Interpreting test results.

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D	Identifying visual defects.
E	Reporting test results.
F	Recommending appropriate actions for dealing with defect apparatus.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting functional and quality tests on assembled electronic apparatus.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to conducting quality and functional tests on assembled electronic apparatus in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Assembly

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UEENEEA106A Use lead-free soldering techniques

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers connecting/de-connecting electronic components using lead-free soldering. It encompasses working safely, high reliability soldering/de-soldering, checking components against job specifications, testing and following quality procedures.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to carryout lead-free soldering.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control measures for work preparation are followed
	1.3	The nature of the work is determined from documentation or from work supervisor to establish the scope of work to be undertaken
	1.4	Work is coordinated with others involved in the work to ensure work schedules are met and safety measures are followed.
	1.5	Materials required for the work are sourced and check for compliance with lead-free soldering requirements and in accordance with established procedures
	1.6	Tools and equipment required for the work are selected for their effectiveness and checked for correct operation and safety
2 Carry out lead-free soldering	2.1	OHS risk control work measures and procedures are followed
	2.2	Knowledge of lead-free soldering characteristic and requirements are applied to soldering/de-soldering operations
	2.3	Components are connected and de-connected in accordance with lead-free soldering principles and technology
	2.4	Work is carried out in compliance with quality

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ELEMENT	PERFORMANCE CRITERIA	
		procedures and enterprise/industry standards
	2.5	Lead-free soldering is completed in acceptable timeframe and given environment and workplace conditions
3 Check quality of lead-free soldering work.	3.1	OHS risk control measures for work completion are followed
	3.2	Quality of lead-free is checked against enterprise/ industry standards.
	3.3	Functional tests on lead-free soldered connections are carried out in accordance with established routines
	3.4	Actions are taken to rectify defects within the scope of established routines.
	3.5	Report forms/data sheets on lead-free soldering work are completed accurately

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and lead-free soldering techniques for connecting/de-connecting electronic components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA106A Lead-free soldering techniques

Evidence shall show an understanding of Lead-free soldering techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Enterprise quality management system encompassing:

- purpose of a quality system
- procedures pertaining to the relevant work function
- work instructions pertaining to the relevant work function

T2. Lead-free solder issues encompassing:

- safety
- environmental

T3. Solder types and characteristics encompassing:

- solder wires and pastes - including bimetal and trimetal
- solder characteristics - including melt and wetting temperatures, soldering temperature and flow behaviour.
- characteristic differences between lead and lead-free solders.
- industry standards

T4. Types of fluxes and their activity level encompassing:

- water soluble, no-clean and cleanable fluxes

T5. Component requirements for lead-free soldering encompassing:

- printed Circuit board (PCB) - including HAZL, ID marking, conformance certificates and re-working old PCBs
  - component considerations - including lead/end cap material, temperature capability and the like.

T6. Lead-free soldering cleaning requirements encompassing:

- chemicals and consumable materials, when to clean, white residues and the like.

T7. Equipment requirements encompassing:

- temperature stability, recovery capability, tip size, tip shape, tip metal mass, tin erosion and the like.

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REQUIRED SKILLS AND KNOWLEDGE

T8. Soldering techniques encompassing:

- soldering tip selection, temperature setting, preheating, use of soldering irons and the like.

T9 Completed soldered connections compliance requirements

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Apply lead-free soldering technology as described in 8) and including:

A	Following job specifications
B	Using high reliability lead-free soldering/de-soldering techniques
C	Handling components without damage

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D	Adhering to quality procedures
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to applying lead-free soldering technology.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEA101A Assemble electronic components

UEENEEA104A Modify electronic sub assemblies

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated by applying lead-free soldering technology to any of the following in an environment designed specifically for the purpose.

- printed circuit board assembly,
- electronic sub-assembly rework,
- discrete component connections, and
- electronic equipment repair

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Assembly

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UEENEEA107A Make up wiring looms for internal wiring of appliances and machinery

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers assembling wiring loom and fitting termination devices to conductor ends. It encompasses working safely and to a specified standards, identifying cables, measuring, cutting and shaping cables, arranging and securing cables into shaped looms, applying cable end termination devices and undertaken quality checks.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. In particular it is applicable to an industry or enterprise for assembly or repair functions at AQF 2.

Licensing/Regulatory Information

License to practice **3)**

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to

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License to practice **3)**

practice in the workplace where work is carried out on electrical installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to make up wiring looms	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures for work preparation are followed
	1.3	Work instructions including layout, wiring schedule and quality compliance criteria are obtained and understood
	1.4	Materials required for the work are obtained in accordance with established routines and procedures.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Make up wiring looms	2.1	Established OHS risk control work measures are followed
	2.2	Cable specified for each core of the wiring loom is identified, selected and cut the specified length,
	2.3	Wiring loom is assembled and formed in accordance with work instructions, standards and established routines.
	2.4	Cable end and prepared and termination devices and identification tags fitted in accordance with work instructions, standards and established

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ELEMENT	PERFORMANCE CRITERIA	
		routines
	2.5	Procedures for referring non-routine events to immediate supervisor for directions are followed
	2.6	Work is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy practices
3 Check quality of completed wiring looms.	3.1	Established OHS risk control measures for work completion are followed
	3.2	Completed wiring loom assembly is inspected and tested against quality compliance criteria in accordance with established routines.
	3.3	Defects in the quality of the wiring loom are identified and corrected using prescribed procedures.
	3.4	Work report forms are completed accurately and appropriate person(s) notified in accordance with established routine.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and making up and assembling wiring looms.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EA107A **Wiring looms and assembly techniques**

Evidence shall show an understanding of wiring loom assembly techniques to an extent indicated by the following aspects:

T1 Structural components of cables and their purpose

Note:

Components include conductors and conductor material; insulation; sheathings and servings.

T2 Cable types and application in wiring looms

T3 Wiring looms encompassing:

- purpose
- components — cables, ties/supports, cable end terminal devices and identification markers/tags
- assembly techniques using cable schedules and template

T4 Conductor handling and cable terminations encompassing:

- insulation removal and replacement
- application of connecting devices for conductors and terminals
- stress release on cables/conductors.

T5 Wiring loom quality encompassing:

- typical compliance criteria
- testing cable cores (testing includes insulation resistance and continuity of each cable core).
- inspection (inspection points includes correct number and placement of cable cores, cable end terminals, cable ties/supports/enclosures and cable core markers/tags).

T6 Hand and power tools used in making up wiring looms encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Making up wiring looms for internal wiring of appliances and machinery as described in 8) and including:

A Understanding work instructions.

B Obtaining correct materials and tools for the work.

C Checking tools for correct operation and safety.

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D	Identifying, selecting and cutting cable cores to length as specified.
E	Preparing cable ends and fitting termination devices and identification tags as specified.
F	Inspecting and testing the completed wiring loom and identifying non-compliance defects
G	Using prescribed procedures to correct defects in quality of completed wiring loom.
H	Reporting completion of the work appropriately.
I	Dealing appropriately with unplanned events.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in the make up and assembly of wiring looms.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to making up at least two different wiring looms assemblies.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Assembly

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UEENEEA110A Assemble, mount and connect control gear and switchgear

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the assembling and mounting of controlgear and switchgear including the interconnections within a switchboard enclosure intended to operate at voltages up to 1,000 V a.c. or 1,500 V d.c. It encompasses working safely, following standards, specifications and component manufacturers requirements, matching equipment with that specified, terminating cables and connecting wiring and completing necessary documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in a workplace specifically for the purpose of assembling control panels. In another workplace a licence to practise may be required subject to regulation to undertake electrical work. However, practice in this unit is subject to regulations directly related to

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License to practice **3)**

occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG1	Develop and connect electrical control

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Prerequisite Unit(s) **4)**

09A circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assemble, mount and connect controlgear and switchgear	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures for work preparation are followed
	1.3	Work instructions, including layout and wiring diagrams, are obtained and understood.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others
	1.5	Materials required for the work are obtained in accordance with established routines and procedures
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Assemble, mount and connect controlgear and switchgear	2.1	Established OHS risk control work measures are followed
	2.2	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Switchgear/controlgear is fitted in accordance with work instructions, standards and established routines
	2.4	Interconnections are made in accordance with work instructions, standards and established routines
	2.5	Routine quality checks are carried out in accordance with work instructions
	2.6	Completed switchboard is tested against work instructions and industry standards and in strict accordance with OHS risk control measures

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Procedures for referring non-routine events to immediate supervisor for directions are followed
	2.8	Work is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy practices.
3 Check quality of assembled controlgear and switchgear.	3.1	Established OHS risk control measures for work completion are followed
	3.2	Quality of assembled switchboard panel is checked against work instructions and industry standards and in accordance with established routines
	3.3	Prescribed solutions are used where corrective actions to assembled components are necessary
	3.4	Work report forms are completed accurately and appropriate person(s) notified in accordance with established routine

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices, assembling, mounting and connecting switchgear and controlgear.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA110A Switchgear and control gear mounting and wiring

Evidence shall show an understanding of switchgear and control gear mounting and wiring techniques to an extent indicated by the following aspects:

T1 Safety issues associated with switchgear and control gear assembly and installation

T2 Types of switchgear and other equipment encompassing:

- relays
- contactors
- motor starters
- variable drives
- transformers
- fuses
- load break switches
- switch fuses
- circuit breakers
- air break
- oil type
- interlock devices
- bus bars and cleats
- bus ties

T3 Labelling and numbering encompassing:

- cable labelling/identification
- component labelling/identification
- use of terminal strips to assist fault finding

T4 Component layout encompassing:

- wiring and schematic diagrams
- placement /layout of power circuit devices and components
- placement/layout of control circuit devices and components

T5 Choice of switchgear and control gear encompassing:

- voltage ratings

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REQUIRED SKILLS AND KNOWLEDGE

- current ratings
- overload and fuse settings
- number of operations

T6 Other considerations encompassing:

- earthing
- size of power and control circuit conductors
- equipment layout methods and accessories

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble, mount and connect switchgear and controlgear as described in 8) and including:

A Following assembly instructions.

B Correctly selecting and placing, switchgear and control gear.

C Making connection without damaging switchgear/control.

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D	Adhering to quality procedures.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling, mounting and connecting switchgear and controlgear.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated by assembling at least two different control panels comprising more than essential services and general supply main switches, metering and sub main controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Assembly

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UEENEEA112A Fabricate and assemble bus bars

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fabricating and assembling copper and aluminium bus bar for interconnections in switchboards and for specific plant and that has high current demand. It encompasses working safely and to standards and specifications, measuring, cutting, shaping and fixing bus bar and completing necessary documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in a workplace specifically for the purpose of making up and assembling bus bars. In other workplaces, a licence to practise may be required subject to regulation to undertake electrical work. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills **5)**

will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to make up and assemble bus bars.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures for work preparation are followed
	1.3	Work instructions including layout and wiring diagrams are obtained and understood
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others
	1.5	Materials required for the work are obtained in accordance with established routines and procedures
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Make up and assemble bus bars.	2.1	Established OHS risk control work measures are followed
	2.2	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Bus bars are formed/made up in accordance with work instructions, standards and established routines
	2.4	Bus bars are connected in accordance with work instructions, standards and established routines
	2.5	Routine quality checks are carried out in accordance with work instructions
	2.6	Completed bus bar assembly is tested against work instructions and industry standards and in strict accordance with OHS risk control measures
	2.7	Procedures for referring non-routine events to immediate supervisor for directions are followed
	2.8	Work is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy practices
3 Check quality of assembled bus bars.	3.1	Established OHS risk control measures for work completion are followed
	3.2	Quality of bus bar assembly is checked against work instructions and industry standards and in accordance with established routines
	3.3	Prescribed solutions are used where corrective actions to assembled components are necessary
	3.4	Work report forms are completed accurately and appropriate person(s) notified in accordance with established routine

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and making and assembling bus bars.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA112A Bus bar fabrication and assembly techniques

Evidence shall show an understanding of bus bar fabrication and assembly techniques to an extent indicated by the following aspects:

T1 Chemical and metallurgical properties of busbars encompassing:

- copper
- aluminium
- copper clad aluminium
- hard drawn copper
- annealing
- types of high conductivity copper

T2 Design considerations encompassing:

- electrical and thermal resistance
- mechanical strength in tension, compression and shear
- resistance to fatigue failure
- electrical resistance of surface films
- ease of fabrication
- resistance to corrosion
- first cost and high eventual recovery value
- choice of busbar materials
- creep properties
- fatigue properties
- self extinguishing arcs in Cu and Al
- insulated busbar
- provision for busbar expansion

T3 Busbar types encompassing:

- main bus bars
- intermediate bus bars
- cell bus bars
- droppers
- flexible joints
- hanger bars
- short-circuit frames

T4 Current carrying capacity encompassing:

- standard cross sections of bar
- current ratings
- temperature rise

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T5 Shaping and bending equipment and techniques encompassing:

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment

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instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Make up and assemble bus bars as described in 8) and including:

A Following assembly instructions.

B Forming and making up correctly.

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C	Terminating bus bars correctly.
D	Adhering to quality procedures.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in the makeup and assembly of bus bars.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate

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the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to making up at least two different bus bars assemblies one of which shall be custom made.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Assembly

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UEENEEA113A Mount and wire control panel equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers mounting control devices, wiring support in control panel enclosures and installing the interconnecting wiring. It encompasses working safely, following layout and circuit diagrams, mounting equipment, installing and terminating wiring, functional testing and completing necessary documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in a workplace specifically for the purpose of assembling control panels. In another workplace a licence to practise may be required subject to regulation to undertake electrical work. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG109A	Develop and connect electrical control circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to mount and wire control panel equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures for work preparation are followed
	1.3	Work instructions, including layout and wiring diagrams, are obtained and understood.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Materials required for the work are obtained in accordance with established routines and procedures
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Mount and wire control panel equipment.	2.1	Established OHS risk control work measures are followed
	2.2	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Control panels components are fitted in accordance with work instructions, standards and established routines
	2.4	Interconnections are made in accordance with work instructions, standards and established routines
	2.5	Routine quality checks are carried out in accordance with work instructions
	2.6	Completed control panel is tested against work instructions and industry standards and in strict accordance with OHS risk control measures
	2.7	Procedures for referring non-routine events to immediate supervisor for directions are followed
	2.8	Work is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy practices
3 Check quality of control panels.	3.1	Established OHS risk control measures for work completion are followed
	3.2	Quality of assembled control panel is tested against work instructions and industry standards and in accordance with established routines
	3.3	Prescribed solutions are used where corrective

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ELEMENT	PERFORMANCE CRITERIA
	actions to assembled components are necessary
	3.4 Work report forms are completed accurately and appropriate person(s) notified in accordance with established routine

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices, mounting and wiring control panel equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA113A Control panel equipment mounting and wiring techniques

Evidence shall show an understanding of control panel equipment mounting and wiring techniques to an extent indicated by the following aspects:

T1 Control panel types and mounting techniques encompassing:

- metallic
- non-metallic (insulated)
- direct mounting on insulated panels
- rear connections
- DIN mounted switchgear
- strapped harness wiring
- use of duct to support and channel wiring
- clearances

T2 Labelling and numbering encompassing:

- cable labelling/identification
- component labelling/identification
- use of terminal strips to assist fault finding

T3 Component layout encompassing:

- wiring and schematic diagrams
- placement /layout of power circuit devices and components
- placement/layout of control circuit devices and components
- Interconnecting plugs and sockets

T4 Choice of switchgear and control gear encompassing:

- voltage ratings
- current ratings
- overload and fuse settings
- number of operations

T5 Other considerations encompassing:

- earthing of panels

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REQUIRED SKILLS AND KNOWLEDGE

- size of power and control circuit conductors
- effect of high current devices on electromagnetic components or PLCs
- effect on electronic components of other devices

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble and wire control panels as described in 8) and including:

A Following assembly instructions.

B Selecting and placing components correctly.

C Making connection without damaging control panel components.

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D	Adhering to quality procedures.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling and wiring control panels.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated by assembling at least two different control panels comprising controls for more than two electrical machines, electro-mechanical and/or electronic control and devices such as relays, timers, logic controllers, indicators, switches/push buttons and the like.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Assembly

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UEENEEB101A Operate and maintain amateur radio communication stations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit deals with operation and maintenance of amateur radio communication stations suitable to HF, VHF and SHF communication using multiple modes of operation. It encompasses correct operating procedures, safe working practices, following written and oral instruction and procedures, basic testing techniques, dismantling and assembling apparatus, disconnecting and reconnecting components, and operating to the Standard Licence Level as prescribed by the Australian Communication Media Authority.

Application of the Unit

Application of the Unit

2)

This unit may apply to persons entering work in electrotechnology and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do require an Australian Communications and Media Authority (ACMA) license to practice in the workplace provided equipment is not connected to permanent installation wiring at voltage above 50 V a.c. or 120 V d.c. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and Numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to operate an amateur radio communication station.	1.1 OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2 Established OHS risk control measures and procedures are followed in preparation for amateur radio activities
	1.3 The nature of the operation of activity is identified to be within the Amateur Radio Standard Licence Conditions Determination
	1.4 Sources of materials that may be required for the Amateur Radio activities are identified and utilised according to manufacturer specifications and established routines and procedures
	1.5 Interference to other services is recognised and attended to by good operating practices, and advice is sought from the ACMA to ensure interference to other services does not occur
	1.6 Resources, tools, apparatus and testing devices needed to carry out work are obtained and checked for correct operation and safety
2 Operate an amateur radio communication station.	2.1 Established OHS risk control measures and procedures for carrying out the work are followed
	2.2 The need to test or measure equipment is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Circuits/apparatus are checked as being isolated where necessary in strict accordance with OHS requirements and procedures
	2.4	Radio communications operating practices and procedures are demonstrated and are in accordance with established requirements
	2.5	Amateur radio communication station is operated in accordance with Standard Licence Operator's level as prescribed by the Australian Communication Media Authority
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety, discussions with appropriate persons and specified work outcomes
	2.7	Set-up is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles
3 Maintain an amateur radio communication station	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Modules/sub-assemblies are tagged during the dismantling to help ensure correct and efficient reassembly and stored to protect them against loss or damage.
	3.3	Apparatus is dismantled and assembled in accordance with manufacturer guidelines.
	3.4	Repairs are affected efficiently without damage to other components, apparatus or circuits and in accordance with established procedures
	3.5	Repairs are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices
	3.6	Apparatus is assembled in an appropriate sequence with all modules/sub-assemblies and parts correctly placed, secured and connected in

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ELEMENT		PERFORMANCE CRITERIA	
			accordance with manufacturer guidelines and industry practice
		3.7	Repaired radio equipment, where appropriate, is tested and returned to service to ensure operating parameters are not exceeded
		3.8	Procedures for referring non-routine events to appropriate authorities are followed
		3.9	Work and operating area is cleaned and made safe in accordance with established procedures
4	Identify and assemble amateur radio communication equipment and associated apparatus	4.1	Established OHS risk control measures and procedures for carrying out the work are followed
		4.2	Requirements for the item to be assembled are identified
		4.3	Item is assembled in accordance with established procedures and relevant engineering standards
		4.4	Assembled unit is tested to ensure that the operating parameters of the station will not be compromised
		4.5	Adjustments are made to the equipment where required to optimise reception
		4.6	Commission the equipment as constructed for on air performance.
5	Complete work and maintain reports	5.1	OHS work completion risk control measures and procedures are followed
		5.2	Work site is cleaned and made safe in accordance with established procedures
		5.3	Adjustment settings are documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out radio station operation, basic maintenance and assembly of radio communication equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EB101A Amateur radio communication principles, operation and maintenance

Evidence shall show an understanding of amateur radio communication principles, operation and maintenance practices, and technical overview, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Nature of Amateur Radio encompassing:

- Nature of Amateur radio
- Types of licences
- Allocation of frequency bands

T2. Licence Conditions encompassing:

- Conditions of licences
- Purpose of the Amateur Service
- Communications by Amateur stations
- Distress and Urgency signals
- Station identification
- Amateur call signs
- Secret messages
- Entertainment not permitted
- Amateur frequency bands and emissions
- Permitted power output
- Notification of change of address
- Harmful interference
- Authorised use of Amateur stations
- Inspection of Amateur licences
- Restriction of operation to avoid interference
- Use of the Licence Condition Determinations

T3. Mathematics used for Amateur radio operation encompassing:

- addition, subtraction, multiplication and division
- fractions, percentage, and decimal notation

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REQUIRED SKILLS AND KNOWLEDGE

- units and sub-units; (mega, kilo, UNIT, micro, and pico)
- calculations using simple formulae

T4. Amateur radio technical basics encompassing:

- Mains power overview
- Mains power supplies overview
- Voltage and current overview
- Resistance overview
- Ohm's Law overview and the relationship between voltage, current and resistance
- Power in DC circuits overview including calculations related to power in a DC circuit using current and voltage, current and resistance or voltage and resistance.
- Capacitance overview
- Inductance overview
- AC circuits overview
- Impedance and reactance overview
- Tuned circuits overview
- Transformers overview
- Solid state devices overview

T5. Transmitters and Receivers – basic overview encompassing:

- Block diagrams of simple transmitters
- Mixers
- Modulation
- Amplifiers
- Transmission quality
- Receiver parameters and terminology
- Simple block diagrams of a Receiver
- Frequency converters
- IF amplifier
- Automatic Gain Control
- Transceivers

T6. Transmission lines and Antennas overview encompassing:

- Transmission line basics
- Baluns
- Standing waves
- Antenna Matching Units (ATU)
- Antennas
- Identification of common antennas
- Radiated Power

T7. Propagation overview encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Electromagnetic radiation
- Ionosphere

T8. Interference and Electromagnetic Compatibility (EMC) overview encompassing:

- Interference - Points of entry into electronic equipment
- Filters
- EMC

T9. Operating Practices and Procedures overview encompassing:

- Equipment practices
- Authorised frequencies and emissions
- Requirement not to transmit on frequencies in use
- Operating practices
- Operating through a repeater
- Make an all-stations call and change frequency
- Transmitter measurements
- Correcting simple equipment maladjustments
- Recognised abbreviations
- Phonetic alphabet

T10. Safety overview encompassing:

- Dangerous voltages
- Electrical safety - equipment to be approved
- Awareness of State Electricity Authority requirements
- Electrical earthing
- Fuses
- Correct fuses to be used
- Replacing fuses
- Station layout for safety
- Power lead safety
- Know location and desirability of a mains OFF switch
- Actions to be taken in the event of an accident involving electricity
- Electric shocks
- Call for help – use of resuscitation techniques
- Battery safety
- Antennas and safety
- Radio waves can be dangerous
- Safe distance from an antenna
- Antenna erection
- Securing and siting antennas
- Lightning protection

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REQUIRED SKILLS AND KNOWLEDGE

- Safe use of headphones
- Station security

T11. Measurements encompassing:

- Frequency measurements
- RF Power measurements
- SWR measurements
- Multimeter measurements

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

The Australian Communications and Media Authority and the Wireless of Australia have established agreed minimal assessment requirements for licensing of amateur radio stations, including the minimal requirements for assessors.

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the

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most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required, regulatory requirements and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a

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percentile graded result for the purpose of regulatory or licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Operate and maintain an amateur radio station, dismantling and assembling apparatus and disconnecting and reconnecting components including:

A	Following manufacturer service instructions and licence conditions determination for radio station assembly and dismantling, including transmitter, power, measurement and adjustment.
B	Demonstrating on HF and VHF correct operating procedure as prescribed by the Australian Communications and Media Authority.
C	Connecting and disconnecting components to radio equipment manufacturer requirements and appropriate engineering requirements, including minor soldering
D	Identifying common types of transmission lines, coaxial connectors, antennas and symbols.
E	Assembling a radio frequency choke used for the elimination of potential interference.
F	Testing a coaxial cable for continuity and standing wave ratio, including explaining how to correct a high standing wave ratio, and demonstrating the use of a signal strength metre.
G	Demonstrating the correct use of voice repeaters with and without continuous tone coded squelch system (CTCSS) and/or dual tone multi frequency signalling.
H	Correctly using an amateur radio according to ACMA licence and standard operating procedures
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic

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assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Relevant Australian and International standards for the assembly and operation of an amateur radio station.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling, dismantling and operating an amateur radio station, including the assembly of an antenna, power supply unit or an equivalent circuit.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires

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assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to carrying out the operation and maintenance of an amateur radio communication station.

The operation and maintenance shall be limited to:

- the requirements as prescribed by the Australian Communications and Media Authority, Amateur Operator Certificate of Proficiency (Standard) Syllabus Documentation and Licence Conditions Determination, and
- Assembly of an antenna and power supply or equivalent item of apparatus to industry standards, that may include minor soldering

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field 11)

Broadcast

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UEENEEC001B Maintain documentation

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the maintenance of the variety of documentation required to record work activities, purchases and expenses and compliance obligations. It encompasses documentation typically required in an electrotechnology enterprise, work instructions and procedures and time management.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to maintain documentation	1.1	Documentation requirements and methods for the organisation/enterprise are identified, obtained and understood
	1.2	Advice is sought from the work supervisor, when necessary, to ensure the work is correctly documented and coordinate d effectively with others
	1.3	Forms required to document work are obtained in accordance with established routines and procedures
	1.4	OHS risk assessment and control measures are documented before work is commenced in accordance with established routine/procedures.
2 Maintain documentation.	2.1	Activities are documented promptly and at the appropriate time in accordance with established routine/procedures
	2.2	Documentation is checked for accuracy and clarity and any anomalies corrected
	2.3	Where applicable, signature is obtained from an appropriate person and the person's identification documented
	2.4	Where applicable, a copy of any required documentation is forwarded to an appropriate person in accordance with established routine/procedures
	2.5	Procedures for referring non-routine events to immediate supervisor for directions are followed

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and maintaining documentation.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC001B Maintaining documentation

Evidence shall show an understanding of maintaining documentation to an extent indicated by the following aspects:

T1. Enterprise communication methods encompassing:

- Communicating with personnel encompassing:
  - Oral communications
  - Written procedures and work instructions
- Communicating with suppliers
- Communicating with customers

T2. Work activities records encompassing:

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

T3. Using basic computers and applications encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in

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EVIDENCE GUIDE

conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

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EVIDENCE GUIDE

competency in this unit

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain documentation in any electrotechnology enterprise information system, including:

    A Following enterprise documentation requirements.

    B Enabling documentation to communicate clearly to others.

    C Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining documentation.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with any unit or units that require formal documentation.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated by maintaining documentation in any electrotechnology enterprise information system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field	**11)**
	Commercial

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UEENEEC002B Source and purchase material/parts for installation or service jobs

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers sourcing and purchasing/ordering materials/parts for installation or service jobs. It encompasses following job specification, using manufacturer's catalogues, making telephone, internet or email enquiries, selecting compliance materials and completing the necessary purchasing documentation.

Note: In the unit the value of materials for installation jobs is limited to $20k.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the extent of the materials to be purchased.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed
	1.3	The extent of installation or service work is determined from job specifications, drawings or results of service calls
	1.4	Materials required for the work are determined from job specifications or requirements resulting from service calls
	1.5	Materials or parts required are documented in accordance with established routine procedures

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ELEMENT	PERFORMANCE CRITERIA	
2 Source and purchase materials.	2.1	Sources of materials are obtained based on availability and price using catalogues, computers and/or telephone in accordance with established routine procedures
	2.2	Approval to purchase alternative materials/parts is sought from an appropriately qualified and authorised person
	2.3	Price for the supply of materials/parts, particularly non-standard high cost items, is sought in accordance with routine established procedures
	2.4	Approval to purchase materials or parts is obtained in writing from the customer or other authorised person in accordance with established routine procedures
	2.5	Purchases are initiated based on price and availability of materials/parts within the required timeframe and in accordance with established routine procedures
3 Document material purchases.	3.1	Material or part purchases are allocated against the appropriate jobs
	3.2	Material or part purchases are documented in accordance with established routine procedures. Note: Prices to include discounts, GST and delivery costs

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and the sourcing and purchasing of material/parts for installation or service jobs.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC002B Material Acquisition

Evidence shall show an understanding of material acquisition to an extent indicated by the following aspects:

T1. Enterprise communication methods encompassing:

- Communicating with personnel encompassing:
  - Oral communications
  - Written procedures and work instructions
- Communicating with suppliers
- Communicating with customers

T2. Work activities records encompassing:

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

T3. Enterprise purchasing system encompassing:

- Purchasing process
- Common suppliers
- Authorities to purchase

T4. Using basic computers and applications encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.2)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Source and purchase material/parts for installation or service jobs as described in 8) including:

    A Establishing the extent of work on which purchases are to be based.

    B Determining the material or parts required accurately.

    C Using at least two methods to source materials.

    D Obtaining quotations for supply of materials/parts.

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EVIDENCE GUIDE

E Obtaining approval to purchase.

F Establishing availability and arranging supply within the required timeframe.

G Documenting material/part purchases accurately.

H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to sourcing and purchasing of material/parts for installation or service jobs.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEENEED001B Use basic computer applications

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to sourcing and purchasing materials/parts for at least two installation jobs, two service job or one installation and one service job and may apply to any of the following electrotechnology disciplines.

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire Protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable/sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Commercial

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UEENEEC003B Provide quotations for installation or service jobs

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers providing quotations for installation and service work not exceeding $20k. It encompasses following job specification, using manufacturer catalogues, making telephone, internet or email enquiries, selecting compliance materials, pricing materials and labour costs, completing the necessary quotation documentation and applying the necessary customer relations protocols.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the extent of the work.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed
	1.3	The extent of installation or service work is determined from job specifications and discussions with customer and/or other appropriate person(s)
	1.4	The extent of installation or service work on which a quotation is to be given is documented as a job specification and agreement sought with customer or other appropriate person(s)
	1.5	OHS and other regulatory requirements are incorporated in the work on which the quotation is based
	1.6	Requests for alterations to the job specification are negotiated with customer or other appropriate person(s) and within the constraints imposed by regulatory requirements
	1.7	A date by which the quotation is to be submitted is agreed with the customer and/or other appropriate person(s)
2 Develop quotations.	2.1	Material take-offs are performed accurately and checked against job specification(s)
	2.2	Materials, labour and other costs are determined from industry standard labour rates, enterprise costing arrangements and/or material suppliers
	2.3	Quotations are checked for accuracy in costing and against job specification
3 Document and submit quotation.	3.1	Quotation is documented in accordance with established policies and procedures
	3.2	Quotation is submitted to customer within by an agreed date

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and providing quotations for installation and service jobs

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC003B Installation or service jobs quotations

Evidence shall show an understanding of installation or service jobs quotations to an extent indicated by the following aspects:

T1. Enterprise communication methods encompassing:

- Communicating with personnel encompassing:
  - Oral communications
  - Written procedures and work instructions
- Communicating with suppliers
- Communicating with customers

T2. Work activities records encompassing:

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

T3. Enterprise customer relations protocols encompassing:

- Purpose of customer relations
- Procedures for dealing with customers
- Dealing with customer issues

T4. Costing methods in an enterprise encompassing:

- Costing policy
- Purchase prices and discounts for materials
- Labour charge out rates
- Margins

T5. Costing small jobs encompassing:

- Resources to be quantified and costed
- Costing labour plant and materials

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REQUIRED SKILLS AND KNOWLEDGE

- Service costs and margins.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are

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raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide quotations for installation and service jobs on at least two occasions as described in 8) including:

    A Establishing the extent of work on which the quotation is to be based.

    B Taking of material accurately.

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C Costing the job appropriately.

D Checking the quotation.

E Documenting the quotation clearly.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing quotations for installation or service jobs.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEENEED001B	Use basic computer applications relevant to a workplace

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to providing at least one quotation for an installation job and one for a service job. The value of the jobs shall not exceed $20k and may apply to any of the following electrotechnology disciplines.

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire Protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable/sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Commercial

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UEENEEC004B Prepare specifications for the supply of materials and equipment for electrotechnology projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers writing technical specifications for the supply of materials and equipment for electrotechnology projects. It encompasses establishing the performance requirements, comparing requirements with available materials and equipment, specifying material and equipment performance requirements and documenting the specifications.

Application of the Unit

Application of the Unit

2)

This unit is suitable for competency development employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish performance and prescribed parameters of materials and equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	The extent of the work is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
	1.3	The performance and prescribed parameters of materials and equipment is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
	1.4	A date by which the materials and equipment is required is determined from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
	1.5	Activities are planned to meet scheduled timeframe in consultation with others involved in the work.
2 Prepare specifications for supply of materials and equipment.	2.1	Manufacturer specifications and limitations of materials and equipment are sought.
	2.2	Manufacturer specifications and limitations are compared with the established performance and prescribed parameters for materials and equipment.
	2.3	Sources and availability of materials and equipment are established in accordance with organisation policies and procedures.
	2.4	Specifications for the supply of materials and equipment, including required evidence of compliance are developed in accordance with enterprise policy.
	2.5	Additional services such as equipment set up/commissioning and training are incorporate in the specifications where relevant.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Solutions to unplanned events are implemented consistent with enterprise policy.
3 Document and submit quotation.	3.1	Material and equipment supply documentation is forwarded to appropriate person for processing in accordance with enterprise policies.
	3.2	Material and equipment supply documentation is filed in accordance with enterprise policies

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and preparing specifications for the supply of materials and equipment for electrotechnology projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC004B Specifications preparation - materials and equipment

Evidence shall show an understanding of specifications preparation - materials and equipment to an extent indicated by the following aspects:

T1	Purpose and nature of specification
T2	Performance based specifications
T3	Prescriptive specifications
T4	Acceptable evidence of compliance
T5	Additional service required with the supply of equipment
T6	Dealing with suppliers and manufacturer’s
T7	Documenting specification.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1)** Longitudinal competency development approaches to

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EVIDENCE GUIDE

assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Prepare specifications for the supply of materials and equipment for electrotechnology projects as described in 8) including:

    A Ascertain the extent of the project accurately

    B Establishing performance and prescribed parameters of materials and equipment

    C Comparing material/equipment manufacturer specifications and limitations with the established performance and prescribed parameters accurately

    D Including in the specifications required evidence of compliance

    E Identifying the need for additional services and incorporating this in the specification

    F Documenting the specifications clearly

    G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to preparing specifications for the supply of materials and equipment for electrotechnology projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEENEED001B	Use basic computer applications relevant to a workplace

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to preparing specifications for the supply of materials and equipment for at least two different electrotechnology projects exceeding $20k and may apply to any of the following electrotechnology disciplines.

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire Protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable/sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Commercial

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UEENEEC005B Estimate electrotechnology projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers estimate material and labour costs for competitive quotation/tenders for work exceeding $20k. It encompasses reading and understanding job specifications, material take-offs, determining labour and site requirements, costing and documenting.

Application of the Unit

Application of the Unit

2)

This unit is suitable for competency development employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Ascertain the extent of the project.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed.
	1.3	The extent of the project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
	1.4	A date by which the estimate is to be completed is determined from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
	1.5	Activities are planned to meet scheduled timeframe in consultation with others involved in the work.
2 Estimate project.	2.1	Material take-offs are performed accurately and checked against job specifications.
	2.2	Materials, labour and other costs are determined from industry standard labour rates, enterprise costing arrangements and /or material suppliers.
	2.3	Sources and availability of materials and human resources needed for the project are established in accordance with organisation policies and procedures.
	2.4	Estimates are checked and revised where necessary, for accuracy in costing and against job specification, in consultation with appropriate person(s).
	2.5	Solutions to unplanned events are implemented consistent with enterprise policy.
3 Document and submit quotation.	3.1	Project estimates are documented in accordance with established policies and procedures.
	3.2	Quotation is forwarded to appropriate person(s) for inclusion in a submission within the specified

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ELEMENT	PERFORMANCE CRITERIA	
		timeframe.
	3.3	Quotation documentation is filed in accordance with established policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and estimating electrotechnology projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC005B Electrotechnology projects estimation

Evidence shall show an understanding of estimating electrotechnology projects to an extent indicated by the following aspects:

T1. Estimating electrotechnology projects encompassing:

- Documents used in estimating
- Resources to be quantified and costed
- Material take-off methods
- Costing:
  - resource (labour, plant, equipment and materials)
  - contingency
  - money
  - margins
- Labour rates method of costing
- Life cycle costing analysis
- Documenting estimations and costing.
- Evaluating estimates and costs

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment

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Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also

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comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Estimate electrotechnology projects as described in 8) including:

    A Ascertaining the extent of the project accurately.

    B Planning estimation work effectively.

    C Estimating the job competitively.

    D Checking the estimates accurately.

    E Documenting the estimates clearly.

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to estimating electrotechnology projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEENEED001B	Use basic computer applications relevant to a workplace

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to estimating at least two electrotechnology projects for a competitive quotation/tender. The value of the jobs shall exceeding $20k and may apply to any of the following electrotechnology disciplines.

- Automation technologies ·
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire Protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable/sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Commercial

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UEENEEC006B Prepare tender submissions for electrotechnology projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the preparation of tender documents. It encompasses reading and understanding tender requirements and project specifications, verifying estimates and capacity to meet timelines, complying with legal requirements and documenting submissions.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s)

4)

4.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEC005B Estimate electrotechnology projects

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills

5)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Ascertain tender requirements.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed.
	1.3	The extent of the work under the tender is determined from tender documents.
	1.4	Special conditions and requirements for lodging the tender are ascertained from tender documents.
	1.5	Appropriately competent person(s) is engaged to estimate material, labour and other costs.
	1.6	Activities are planned to meet specified tender closing date/time.
2 Assemble tender submission.	2.1	All inputs to the tender are obtained and checked with person(s) responsible for their development.
	2.2	Materials and human resources needed to complete the work under the conditions of the tender are confirmed with person(s) responsible.
	2.3	Legal advice is sought on contingent aspects of the tender.
	2.4	Contingency allowances are included in the tender in accordance with established policies and procedures.
3 Document tender submission.	3.1	Tender submission is documented in tender lodgement requirements and in accordance with established policies and procedures.
	3.2	Tender submission is checked for accuracy against tender documents and all other inputs and made ready for lodgement before the closing date/time.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and preparing tender submissions.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC006B	**Electrotechnology project tenders**

Evidence shall show an understanding of electrotechnology project tenders to an extent indicated by the following aspects:

T1	Purpose and sources of a tender
T2	Documents supplied with a tender
T3	Typical special conditions included in a tender
T4	Tender submission requirements

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1)** Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the

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competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Prepare tender submissions for electrotechnology projects as described in 8) including:

    A Ascertaining the extent of the work under the tender accurately

    B Ascertaining special conditions and requirements for lodging the tender

    C Planning tender submission work effectively

    D Checking all input to the tender submission accurately

    E Applying legal advise to contingent issues

    F Documenting the tender submission ready for lodgement before the closing date/time

    G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to preparing tender submission for electrotechnology projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEENEED001B	Use basic computer applications relevant to a workplace

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to preparing tender submissions for at least two electrotechnology projects. The tenders apply to any of the following electrotechnology disciplines.

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire Protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable/sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Commercial

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UEENEEC007B Manage contract variations

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers estimating and negotiating variations to contracted work. It encompasses understanding the specification on which the contracted price is based, identifying contract variations, negotiating and using methods for submitting variations, documenting and applying customer relations protocols.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Ascertain the terms of the contract.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed.
	1.3	The extent of the work under the original contract price is ascertained from tender submission/acceptance documents and associated work specifications, plans and diagrams.
	1.4	Arrangements under the contract for costing and claiming variations are ascertained from tender submission/acceptance and contract documents.
2 Manage contract variations.	2.1	The extent of a variation is determined and formal variation issued by the customer representative or other appropriate person.
	2.2	Variation is priced in accordance with the contract and established policies and procedures.
	2.3	Variation approvals are negotiated with reference to contract obligations of both parties and in accordance with established policies and procedures.
	2.4	Variation resolution proceeding is initiated for variations not agreed to by the client representative.
	2.5	Approved variations are submitted for payment promptly and in accordance with established policies and procedures.
	2.6	Variations documents are forwarded to appropriate person(s) within the organisation in accordance with established policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and managing contract variations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC007B Contract variations management

Evidence shall show an understanding of contract variations management to an extent indicated by the following aspects:

T1. Estimating electrotechnology projects encompassing:

- Documents used in estimating
- Resources to be quantified and costed
- Material take-off methods
- Costing:
  - resource (labour, plant, equipment and materials)
  - contingency
  - money
  - margins
- Labour rates method of costing
- Life cycle costing analysis
- Documenting estimations and costing.
- Evaluating estimates and costs

T2. Format, responsibilities and obligations of a contract encompassing:

- Contract purpose and formats
- Documents legally attached to a contract
- Responsibilities and obligations of parties entering a contract
- Regulatory requirements

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required

9.2)

Before the critical aspects of evidence are considered all

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to demonstrate competency in this unit

prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Manage contract variations as described in 8) including:

    A Ascertaining the terms of the contract accurately.

    B Ascertaining the contract arrangements for claiming variations.

    C Pricing variation in accordance with the contract.

    D Initiating variation resolution proceeding, where applicable.

    E Negotiating contract variation approvals.

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EVIDENCE GUIDE

F Forwarding variation documentation appropriately.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to managing contract variations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

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other units	UEENEED001B	Use basic computer applications relevant to a workplace

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to managing at least five variations to electrotechnology contracts. The contracts may apply to any of the following electrotechnology disciplines

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire Protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable/sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC008B Receive and store materials and equipment for electrotechnology work

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the receiving and storing of materials and equipment for a construction site or workshop store. It encompasses receiving materials and equipment, checking consignment notes, storing materials and equipment and completing the necessary documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work

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platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Receive materials and equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work measures and procedures are followed.
	1.3	Documentation on pending material and equipment deliveries is read, and content and time of the delivery is understood.
	1.4	Deliveries are checked against consignment documentation before they are received.
	1.5	Discrepancies in deliveries are notified to work supervisor and supplier in accordance with established routines.
	1.6	Materials and equipment are handled in strict accordance with OHS risk control work preparation measures and procedures.

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ELEMENT	PERFORMANCE CRITERIA	
2 Store materials and equipment.	2.1	OHS risk control work measures and procedures are followed.
	2.2	Material and equipment are stored to prevent damage or loss in accordance with established routines.
	2.3	Security of the stored materials and equipment is maintained in accordance with established routines.
	2.4	Material and equipment documentation is forwarded to an appropriate person in accordance with established routine/procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and of receiving and storing materials and equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC008B Electrotechnology work store materials and equipment

Evidence shall show an understanding of electrotechnology work store materials and equipment to an extent indicated by the following aspects:

T1. Enterprise communication methods encompassing:

- Communicating with personnel encompassing:
  - Oral communications
  - Written procedures and work instructions
- Communicating with suppliers
- Communicating with customers

T2. Work activities records encompassing:

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

T3. Stock control methods encompassing:

- Enterprise purchasing policy
- Stock data base
- Purchase and sales entry mechanisms
- Reordering methods

T4. Using basic computers and applications encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Receive and store materials and equipment for electrotechnology work as described in 8) including:

    A Determining content and time of pending deliveries from relevant documentation.

    B Dealing with discrepancies in deliveries.

    C Storing and securing materials and equipment to prevent damage or loss.

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D Forwarding documentation appropriately.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to receiving and storing materials and equipment for electrotechnology work.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with any unit or units

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that require formal documentation.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to receiving and storing materials and equipment for a construction site or workshop store.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Commercial

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UEENEEC009B Provide quotations for inspection and compliance audit services

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers providing quotations for compliance inspections and technical safety audits. It encompasses reading and understanding job specification, pricing labour and site costs, completing the necessary quotation documentation and applying the necessary customer relations protocols.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the extent of the work.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed.
	1.3	The extent of inspection or audit service work is determined from job specifications and drawings and from discussions with customer and/or other appropriate person(s).
	1.4	The extent of inspection or audit service work on which a quotation is to be given is documented as a job specification and agreement sought with customer or other appropriate person(s).
	1.5	OHS and other regulatory requirements are incorporated in the work on which the quotation is based.
	1.6	A date by which the quotation is to be submitted is agreed with the customer and/or other appropriate person(s).
2 Develop quotations	2.1	Labour and other costs are determined from industry standard labour rates and/or enterprise costing arrangements.
	2.2	Costing is performed accurately and checked against job specifications.
	2.3	Quotations are checked for accuracy in costing and against job specifications.
3 Document and submit quotation.	3.1	Quotation is documented in accordance with established policies and procedures.
	3.2	Quotation is submitted to customer within by an agreed date.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and providing quotations for inspection and compliance audit services.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC009B Inspection and compliance audit services quotations

Evidence shall show an understanding of inspection and compliance audit services quotations to an extent indicated by the following aspects:

T1. Enterprise communication methods encompassing:

- Communicating with personnel encompassing:
  - Oral communications
  - Written procedures and work instructions
- Communicating with suppliers
- Communicating with customers

T2. Work activities records encompassing:

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

T3. Enterprise customer relations protocols encompassing:

- Purpose of customer relations
- Procedures for dealing with customers
- Dealing with customer issues

T4. Costing methods in an enterprise encompassing:

- Costing policy
- Purchase prices and discounts for materials
- Labour charge out rates
- Margins

T5. Costing small jobs encompassing:

- Resources to be quantified and costed

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REQUIRED SKILLS AND KNOWLEDGE

- Costing labour plant and materials
- Service costs and margins.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more

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critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide quotations for inspection and compliance audit services as described in 8) including:

    A Establishing the extent of work on which the quotation is to be based.

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B Determining the extent of labour and other costs.

C Costing the job appropriately.

D Checking the quotation.

E Documenting the quotation clearly.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing quotations for inspection and compliance audit services.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEENEED001B	Use basic computer applications relevant to a workplace

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to providing at least one quotation for an inspection job and one for compliance audit. The value of the jobs shall not exceeding $20k and may apply to any of the following electrotechnology disciplines.

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable/sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Commercial

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UEENEEC010B Deliver a service to customers

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the interacting with customers to identify and meet their service needs. It encompasses following community and enterprise policies and standards, identifying customer needs, identifying and resolving problems/issues and maintaining product/service quality.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Interact with customers.	1.1	Communication with customers is conducted in a professional and courteous manner according to established procedures.
	1.2	Customer enquiries are responded to promptly and politely and in accordance with established procedures.
	1.3	Personal dress and presentation is maintained in line with established procedures.
	1.4	Appropriate interpersonal skills are used to facilitate accurate and relevant exchange of information.
2 Identify customer needs.	2.1	Customer needs are assessed so that priorities for service delivery can be identified in accordance with established procedures.
	2.2	Appropriate questioning and active listening are used to determine customer needs.
	2.3	Customers are provided with information about available options for meeting their needs and assisted to identify their preferred option.
	2.4	Personal limitations in addressing customer needs are identified and where appropriate assistance is sought from appropriate personnel.
3 Deliver a service to customers.	3.1	Prompt customer service is provided to meet identified needs in accordance with established procedures.
	3.2	Service provided follows OHS policies and procedures and work is appropriately sequenced in accordance with requirements.
	3.3	Service provided is coordinated effectively with others involved on the work site.
	3.4	Customer complaints are handled sensitively and courteously in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	3.5	Opportunities to enhance the quality of service and products are identified and taken whenever possible.
4 Evaluate and complete service.	4.1	Own work is monitored and adjusted according to requirements for job quality, customer service and efficient resource use.
	4.2	Customer service records are inspected and verified after service is completed to ensure requirements are met.
	4.3	Appropriate personnel are notified of the completion of the repair work and details are documented in accordance with established procedures and requirements.
	4.4	Variations in the quality of service and/or products from required standards are detected and reported in accordance with established procedures.
	4.5	Additional information or follow-up action is completed in line with customer needs.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and delivering a service to customers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC010B Customer service

Evidence shall show an understanding of customer service to an extent indicated by the following aspects:

T1. Enterprise communication methods encompassing:

- Communicating with personnel encompassing:
  - Oral communications
  - Written procedures and work instructions
- Communicating with suppliers
- Communicating with customers

T2. Work activities records encompassing:

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

T3. Problem solving concepts and techniques encompassing:

- Identify problems - process and quality problems; equipment selection, availability and failure; teamwork and work allocation problems; safety and emergency situations and incident; performance gaps; profit improvement and the like.
- Mathematical Tools - average, standard deviation and the like.
- Use of analytical techniques in problem solving - brainstorming; fishbone diagrams/cause and effect diagrams; logic trees; process logic/process requirements; similarity/difference analysis; pare to analysis; force field/SWOT analysis.
- Using tools to assistance in problem solving - Procedures and work instructions; Safety data sheets; Job cards; Maintenance logs; Plant drawing.
- Determine corrective action:
  - Tools
  - Mode of communication procedure used within each enterprise

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REQUIRED SKILLS AND KNOWLEDGE

- Established work procedures and policies
- Size and structure of the teams/enterprise
- Group goals - team, section, enterprise
- Enterprise specific conflict resolution procedures
- Action plans
- Priority requirements
- Measurable objectives
- Resource requirements
- Methods for reaching objectives
- Timelines
- Safety requirements
- Risk assessment
- Environmental requirements

- Communicate recommendations - feedback requirements; corrective action and analysis; following up recommendations and the like.
- Implement Monitoring encompassing:
  - Identifying components to be measured
  - Measurement and monitoring techniques
  - Measurement and monitoring tools

T4. Enterprise customer relations protocols encompassing:

- Purpose of customer relations
- Procedures for dealing with customers
- Dealing with customer issues

T5. Enterprise quality management system encompassing:

- Purpose of a quality system
- Procedures pertaining to the relevant work function
- Work instructions pertaining to the relevant work function

T6. Instructing users in the use of specific items of equipment and systems encompassing:

- Methods for evaluating user needs - how equipment is used efficiently and safely and identifying wear and tear and damage to the equipment that requires repairing.
- Basic instruction methods - be appropriate to the culture of the users and the equipment for which instruction is given.
- Methods for evaluating user’s ability use equipment correctly

Evidence Guide

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EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required

9.2)

Before the critical aspects of evidence are considered all

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EVIDENCE GUIDE

to demonstrate competency in this unit

prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Deliver a service to customers as described in 8) including:

    A Interacting with customers appropriately.

    B Identifying customer needs accurately.

    C Identifying and resolving customer issues promptly and amicably.

    D Delivering a service.

    E Reflecting on the completed service positively.

    F Dealing with unplanned events by drawing on

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EVIDENCE GUIDE

essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to delivering a service to customers.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with any unit or units that require formal documentation.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated by delivering a service to customers in any of the electrotechnology disciplines.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field	**11)**
	Commercial

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UEENEEC012B Direct technical and non-technical enquiries to appropriate personnel

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers clarifying the nature of technical and non-technical enquiries of customers and co-workers and directing such enquiries to appropriate personnel. It encompasses working safely, applying appropriate knowledge to questioning enquirers, clarifying the point of an enquiry, directing enquiries appropriately and documenting actions.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Interact with customers and co-workers	1.1	Communication with customers is conducted in a professional and courteous manner according to established procedures.
	1.2	Customer/co worker enquiries are responded to promptly and politely and in accordance with established procedures.
	1.3	Appropriate interpersonal skills are used to facilitate accurate and relevant exchange of information.
2 Direct enquirers to appropriate personnel	2.1	Customer/co-worker enquiries are assessed to determine whether the enquiry is technical or non-technical.
	2.2	Appropriate questioning and active listening are used, drawing on general knowledge of the specific electrotechnology discipline, to determine the nature of the enquiry.
	2.3	Customers are directed to appropriate personnel to respond to the enquiry.
	2.4	Appropriate personnel to whom the enquiry is directed are informed of the nature of the enquiry and identity of the enquirer.
	2.5	All enquiries and how they where responded to are documented in accordance with routine procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and directing technical and non-technical enquiries to appropriate personnel.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC012B Technical and non-technical enquiries

Evidence shall show an understanding of technical and non-technical enquiries to an extent indicated by the following aspects:

T1. Enterprise communication methods encompassing:

- Communicating with personnel encompassing:
  - Oral communications
  - Written procedures and work instructions
- Communicating with suppliers
- Communicating with customers

T2. Work activities records encompassing:

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

T3. Enterprise customer relations protocols encompassing:

- Purpose of customer relations
- Procedures for dealing with customers
- Dealing with customer issues

T4. Enterprise quality management system encompassing:

- Purpose of a quality system
- Procedures pertaining to the relevant work function
- Work instructions pertaining to the relevant work function

T5. Work covered by the employing enterprise encompassing:

- Systems and equipment of the electrotechnology disciplines covered by the enterprise
- Where and how the electrotechnology disciplines are used

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REQUIRED SKILLS AND KNOWLEDGE

- The work activities involved
- Role of various sectors of personnel in the enterprise

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more

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EVIDENCE GUIDE

critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Direct technical and non-technical enquiries to appropriate personnel as described in 8) including:

    A Interacting with customers appropriately.

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B Identifying nature of the enquiry accurately.

C Directing the enquirer to the appropriate personnel.

D Informing appropriate personnel of the enquiry.

E Documenting all enquiries in accordance with routine procedures.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to directing technical and non-technical enquiries to appropriate personnel.

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EVIDENCE GUIDE

Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with any unit or units that require formal documentation.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to directing technical and non-technical enquiries to appropriate personnel in any of the electrotechnology disciplines.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC013B Participate in business equipment work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

Practice in the workplace and during training is also

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subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Comply with business equipment industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
		1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently.
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC013B Business equipment work competency development activities

Evidence shall show an understanding of business equipment work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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EVIDENCE GUIDE

on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in business equipment work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency development activities in accordance with

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requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

J Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. This unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant state/territory training act seeking to complete the qualification. Incorporate therein is the requirement for deployment of an approved competency development (training) plan.

The Plan specifies the competency standard units, which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

1) The competency development plan:
   - Context of the plan
   - State/Territory regulatory requirements (Acts/Regulations)
   - Competency development (training) contracts
   - Competency development (nominal training) period
   - Purpose of competency development (training) plans
   - Process in developing competency development (training) plans
   - Parties involved in the competency development (training) plan
   - Responsibilities of Parties:
     - RTO responsibilities
     - Role of State Training Authority (STA)
     - Employer responsibilities
     - Employee/Learner responsibilities
   - Context of responsible parties:
     - Industry customs, work practices
     - Industry bodies – employer and employee representatives
     - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
     - Vocational and technical education system – AQF, credentials, AQTF

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    - RTO training practices, requirements, administration, costs, and support services
- Workplace practice and exposure:
    - Timely reporting of workplace exposures and practice
    - Supervisor confirmation of workplace exposures and practices in a structured workplace report
    - Workplace evidence reporting:
    - Unit of work
    - Elements and performance of work
    - Range of items exposed to and practised on
    - Level of supervision received
    - Period of exposure
- Workplace evidence validation:
    - Currency of evidence
    - Authenticity of evidence
    - Sufficiency of evidence
- Workplace evidence reporting review:
    - Contribution towards progressive development for the qualification
    - Competency standard unit progressive reporting
    - Regular review of progress report
    - Timing of periodic monitoring/evaluation
    - Procedures for monitoring and analysing progress
    - Procedures for responding to anomalies in competency development
    - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
    - Stages of progress that are to be met in developing competent performance
    - Evaluation of progress against requisite stages of development towards competent performance
    - Implementation of remedial measures
    - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC014B Participate in computer equipment work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Comply with computer equipment industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
	1.2	Clarification on how work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
	1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2 Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
	2.2	All components of the competency development plan are followed diligently.
	2.3	Opportunities to practise skills and apply knowledge relative to a particular competency are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC014A Computer equipment work competency development activities

Evidence shall show an understanding of computer equipment work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in computer equipment work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency

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development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

J Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC016B Participate in voice and data communications work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Comply with voice and data communications industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained
	1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person
	1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person
2 Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons
	2.2	All components of the competency development plan are followed diligently
	2.3	Opportunities to practise skills and apply knowledge relative to a particular competency are pursued
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons
	2.7	Obligations are met for periodic and timely reporting of competency development activities
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC016B Voice and data communications work competency development activities

Evidence shall show an understanding of voice and data communications work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice's/Learner's responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

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EVIDENCE GUIDE

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated

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within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in voice and data communications work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures,

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and with the approval of an authorised person

F Reporting periodically the competency development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field 11)

Commercial

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UEENEEC017B Participate in appliance servicing work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ061B Verify compliance and functionality of appliances

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Comply with appliance servicing industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
		1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency are

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ELEMENT	PERFORMANCE CRITERIA	
		pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC017B Appliance servicing work competency development activities

Evidence shall show an understanding of appliance servicing work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in appliance servicing work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency development activities in accordance with

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requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

This unit shall be assessed concurrently with other units in a qualification.

UEENEEJ061B	Verify compliance and functionality of appliances

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC018B Participate in electrical machine repair work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

Practice in the workplace and during training is also

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subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Comply with electrical machine repair industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
		1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently.
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC018B Electrical machine repair work competency development activities

Evidence shall show an understanding of electrical machine repair work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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EVIDENCE GUIDE

on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in electrical machine repair work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency

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EVIDENCE GUIDE

development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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EVIDENCE GUIDE

Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC019B Participate in switchgear and controlgear work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

Practice in the workplace and during training is also

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subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Comply with switchgear and controlgear industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
		1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently.
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC019B Switchgear and controlgear work competency development activities

Evidence shall show an understanding of switchgear and controlgear work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in switchgear and controlgear work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency

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development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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EVIDENCE GUIDE

Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
  - Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
  - Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field 11)

Commercial

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UEENEEC020B Participate in electrical work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a licence to practise in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly

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related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Comply with electrical industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
	1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
	1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2 Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
	2.2	All components of the competency development plan are followed diligently.
	2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC020B Electrical work competency development activities

Evidence shall show an understanding of electrical work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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EVIDENCE GUIDE

on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in electrical work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency development activities in accordance with

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requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

This unit shall be assessed concurrently with other units in a qualification.

UEENEEG005B	Verify compliance and functionality of general electrical installations

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services
- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC021B Participate in electronics and communications work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other

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conditions may apply in some States and Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Comply with electronics and communications industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
		1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently.
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC021B Electronics and communications work competency development activities

Evidence shall show an understanding of electronics and communications work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in electronics and communications work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency

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development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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EVIDENCE GUIDE

Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
  - Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
  - Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field 11)

Commercial

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UEENEEC022B Participate in fire protection control work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

Practice in the workplace and during training is also

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subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Comply with fire protection control industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
		1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently.
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC022B Fire protection control work competency development activities

Evidence shall show an understanding of fire protection control work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in fire protection control work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency

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development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC023B Participate in gaming electronic work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

Practice in the workplace and during training is also

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subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Comply with gaming electronic industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
	1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
	1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2 Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
	2.2	All components of the competency development plan are followed diligently.
	2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC023B Gaming electronic work competency development activities

Evidence shall show an understanding of gaming electronic work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels
  - career paths

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REQUIRED SKILLS AND KNOWLEDGE

- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:
  - designated fire and emergency exists

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REQUIRED SKILLS AND KNOWLEDGE

- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures
- Scope for an industry/enterprise to establish work activity policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data

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gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in gaming electronic work and competency development activities as described in 8) including:

    A Identifying and confirming the context,

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requirements and responsibilities of the competency development (training) plan to be met

B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

D Seeking clarification of how particular work is to be carried out and the procedures involved

E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

F Reporting periodically the competency development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC024B Participate in instrumentation and control work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

Note:

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1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Comply with instrumentation and control industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
		1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently.
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC024A Instrumentation and control work competency development activities

Evidence shall show an understanding of instrumentation and control work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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EVIDENCE GUIDE

on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in instrumentation and control work and competency development activities as detailed in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency

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development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

This unit shall be assessed concurrently with other units in a qualification.

UEENEEI012B	Verify compliance and functionality of process control installations

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field 11)

Commercial

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UEENEEC025B Participate in refrigeration and air conditioning work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

Note:

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1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Comply with refrigeration and air conditioning industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
		1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently.
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC025B Refrigeration and air conditioning work competency development activities

Evidence shall show an understanding of refrigeration and air conditioning work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence

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need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in refrigeration and air conditioning work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency

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development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

This unit shall be assessed concurrently with other units in a qualification.

UEENEEJ009B	Verify compliance and functionality of refrigeration and air conditioning installations

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
  - Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC026B Participate in security equipment work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

Practice of this unit in the workplace is subject to State

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and Territory Security Industry regulations. Where the security system has a call-back-to-base facility practice in the workplace is also subject to ACMA regulations to undertake cabling work.

Note:

Units 'UEENEEF016A and UEENEEF002B provide the required skill and knowledge for registration in accordance with ACMA regulations for undertaking cabling work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

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Literacy and numeracy skills	**4.2)** Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy' Reading 4 Writing 4 Numeracy 4

Employability Skills Information

Employability Skills	**5)** The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Comply with security equipment industry/enterprise work policies and procedures	1.1 Industry/enterprise policies and procedures for all work activities are obtained 1.2 Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency are pursued
		2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
		2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
		2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
		2.7	Obligations are met for periodic and timely reporting of competency development activities.
		2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC026A Security equipment work competency development activities

Evidence shall show an understanding of security equipment work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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EVIDENCE GUIDE

on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in security equipment work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency development activities in accordance with

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requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
  - Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEEC027B Participate in rail communications and networks work and competency development activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of industry/enterprise policies in actively participating in work activities and in one's own competency development. It complies with established industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulation for undertaking electrical work.

Note:

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1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Comply with rail communications and networks industry/enterprise work policies and procedures	1.1	Industry/enterprise policies and procedures for all work activities are identified and obtained.
		1.2	Clarification on how particular work is to be carried out and the procedures involved is sought from the immediate supervisor/appropriate person.
		1.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
2	Monitor and respond to a personal competency development plan.	2.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		2.2	All components of the competency development plan are followed diligently.
		2.3	Opportunities to practise skills and apply knowledge relative to a particular competency

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ELEMENT	PERFORMANCE CRITERIA	
		are pursued.
	2.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
	2.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
	2.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.7	Obligations are met for periodic and timely reporting of competency development activities.
	2.8	Periodic competency development activities report is validated by an appropriate person in accordance with industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EC027A Rail communications and networks work competency development activities

Evidence shall show an understanding of rail communications and networks work competency development activities to an extent indicated by the following aspects:

T1. Responsibilities under a competency development plan:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels

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REQUIRED SKILLS AND KNOWLEDGE

- career paths
- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- designated fire and emergency exists
- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

T2. Methods of monitoring and reporting competency development activities encompassing:

- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

T3. Enterprise work activities policies and procedures encompassing:

- Need for policies and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Scope for an industry/enterprise to establish work activity policies and procedures - policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Following work activities procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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EVIDENCE GUIDE

on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in rail communications and networks work and competency development activities as described in 8) including:

    A Identifying and confirming the context, requirements and responsibilities of the competency development (training) plan to be met

    B Identifying and confirming the critical industry, enterprise and regulatory policies, procedures and context applicable to all work activities

    C Identifying and confirming the applicable training practices, requirements, administration, costs and support service policies and procedures provided by the RTO to all vocational and technical education activities

    D Seeking clarification of how particular work is to be carried out and the procedures involved

    E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

    F Reporting periodically the competency

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EVIDENCE GUIDE

development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events according to requirements

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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EVIDENCE GUIDE

Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** Competency in this unit shall be assessed concurrently with the all core and nominated elective units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated following the completion of a range of performance process activities that contribute to assisting in the evaluation of progress towards the development of competency. The unit applies to those engaged in employment-based programs covered by an approved contract of training under a relevant State/Territory training Act seeking to complete the qualification. Incorporated therein is the requirement for deploying an approved competency development (training) plan.

The Plan specifies the units which are to be attained to complete the qualification. This unit is a core requirement for the completion of the qualification. It encompasses the processes required to participate in the development of competence by an apprentice/learner in the industry and in particular the activities associated with performance in the workplace and in vocational and technical education. It includes but is not limited to recognising and participating in:

- The competency development plan:
  - Context of the plan
  - State/Territory regulatory requirements (Acts/Regulations)
  - Competency development (training) contracts
  - Competency development (nominal training) period
  - Purpose of competency development (training) plans
  - Process in developing competency development (training) plans
  - Parties involved in the competency development (training) plan
- Responsibilities of Parties:
  - RTO responsibilities
  - Role of State Training Authority (STA)
  - Employer responsibilities
  - Employee/Learner responsibilities
- Context of responsible parties:
  - Industry customs, work practices
  - Industry bodies – employer and employee representatives
  - Regulatory bodies, including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - Vocational and technical education system – AQF, credentials, AQTF
  - RTO training practices, requirements, administration, costs, and support

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services

- Workplace practice and exposure:
  - Timely reporting of workplace exposures and practice
  - Supervisor confirmation of workplace exposures and practices in a structured workplace report
- Workplace evidence reporting:
  - Unit of work
  - Elements and performance of work
  - Range of items exposed to and practised on
  - Level of supervision received
  - Period of exposure
- Workplace evidence validation:
  - Currency of evidence
  - Authenticity of evidence
  - Sufficiency of evidence
- Workplace evidence reporting review:
  - Contribution towards progressive development for the qualification
  - Competency standard unit progressive reporting
  - Regular review of progress report
  - Timing of periodic monitoring/evaluation
  - Procedures for monitoring and analysing progress
  - Procedures for responding to anomalies in competency development
  - Procedures for liaison with the workplace supervisor
- Periodic evaluation of competency development (training) progress:
  - Stages of progress that are to be met in developing competent performance
  - Evaluation of progress against requisite stages of development towards competent performance
  - Implementation of remedial measures
  - Periodic progress report formally confirmed to parties

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Commercial

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UEENEED101A Use computer applications relevant to a workplace

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the basic use of personal computers application relevant to a work function. It encompasses switching the computer on, applying user preferences, selecting basic applications, entering and retrieving information and printing files.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to use computer applications.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in relation to computer and keyboard use are followed.
	1.3	Information required for the use of the application is obtained from appropriate sources.
	1.4	Computer is started up and desktop icons are manipulated to access desired application, directories and files.
	1.5	On-screen instructions in relation to any anomaly such as a virus warning are followed.
	1.6	Help directory is used to resolve any straightforward start up or access issues or anomalies.
2 Use computer basic application.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Information is added, altered or deleted as needed in accordance with application user instructions.
	2.3	Routine checks are made to ensure accuracy of information in accordance with quality requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Output information from an application.	3.1	Completed files are stored appropriately in accordance with enterprise requirements.
	3.2	Files are printed for a formal record and/or to forward to others.
	3.3	Files are sent via email in a readable format.
4 Shut down computer.	4.1	Files are named, arranged, saved and backed up in accordance with enterprise requirements.
	4.2	Computer shutdown procedures are followed and computer switched off.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices using basic computer applications relevant to a workplace.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED101A **Basic Computer Applications**

Evidence shall show an understanding of computer use basics to an extent indicated by the following aspects:

T1 Starting up

T2 Selecting application

T3 Entering information

T4 Saving

T5 Printing

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use basic computer applications relevant to workplace as described in 8) and including:

A Correctly starting-up a computer.

B Dealing with anomalies appropriately.

C Following application instructions to input and output information.

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D	Storing information appropriately.
E	Outputting information to a printer.
F	Forwarding information via email and/or web mail in a readable format.
G	Producing, storing and forwarding engineering related reports and/or results using at least three computer applications according to requirements
H	Shutting down a computer correctly
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above, evidence should show demonstrated competency to produce, store and forward

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engineering related reports and/or results using a range of computer applications.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall/may be demonstrated in relation to at least three of the following using computer applications to produce, store and forward engineering related reports and/or results at a basic level.

- Word processing
- Spread sheet
- Drawings
- Business management
- Apparatus set-up
- Note:

  Apparatus set-up applications are invariably vendor specific and include icon-based integration and control applications.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED102A Assemble, set-up and test computing devices

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers assembly, setting up and testing personal computers as directed in computer service manuals. It encompasses safe working practices, checking computer components, assembling components to form a basic personal computer, installing and testing basic operating system, drivers and application software, following written and oral instruction and applying customer relations procedures.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment formally-acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may

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License to practice **3)**

require a license to practice in the workplace subject to regulations for undertaking electrical work. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Assemble computing devices.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in relation to computer and keyboard use are followed.
	1.3	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.4	Computer, components, operating system and application software are obtained in accordance with established routines and checked as meeting requirements.
	1.5	Computer components are assembled and connected in accordance with manufacturer's instructions.
	1.6	Routine quality checks are carried out in accordance with work instructions.
	1.7	Procedures are followed for referring non-routine events to immediate supervisor for directions.

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ELEMENT	PERFORMANCE CRITERIA	
2 Install operating system and application software.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Minimum hardware requirements are established that are appropriate for the operating system that will be installed.
	2.3	Computer is started up and on-screen instructions for the installation of the operating system to default configuration are followed, including drivers and network interfaces.
	2.4	Application software is installed to default configuration following on-screen installation instruction.
	2.5	Ensure authentication and data security and integrity is implemented on a computing device which may include antivirus and logins.
	2.6	Computer shutdown procedures are followed and computer switched off.
	2.7	Routine quality checks are carried out in accordance with work instructions.
	2.8	Procedures for referring non-routine events to immediate supervisor for directions are followed.
3 Test computer operation.	3.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Computer is switched on and start-up procedures are followed and checked.
	3.3	Operating system and application programs are checked to be opening and operating correctly.
	3.4	Faults are identified as being the result of faulty hardware or software.
	3.5	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established

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ELEMENT	PERFORMANCE CRITERIA	
		safety procedures.
	3.6	Faults are rectified in accordance with computer hardware, operating system and application instructions.
	3.7	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	3.8	Computer shutdown procedures are followed and computer switched off.
	3.9	Work is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
4 Complete work and report.	4.1	OHS risk control work completion measures and procedures are followed.
	4.2	Work area is cleaned and made safe in accordance with established procedures.
	4.3	Work supervisor is notified of the completion of the work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices, assembling, setting-up and testing personal computers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED102A Computing device servicing

Evidence shall show an understanding of computing devices' hardware structure to an extent indicated by the following aspects:

T1 Sub-assemblies architecture and their function

Note: Examples include motherboards, memory modules, video modules, connecting buses, storage devices and other components.

T2 Assembling and dismantling techniques

T3 Hardware faults and troubleshooting techniques

Note: Confined to subsystem level eg. PCI –E Cards or similar,

T4 Basic network hardware and components

T5 Connection of network media

T6 Set up of standard network configuration

T7 Sub-assemblies faults and troubleshooting techniques

T8 Repair techniques

T9 Operating systems in use.

T10 Operating System installation and configuration

T11 Basic authentication and file and directory security

T12 Occupational health and safety fundamentals as they relate to computing deviceassembly/disassembly.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble, set up and test computing device as described in 8) and including:

A	Correctly connecting computing devices components and peripherals.
B	Installing a basic operating system for single user and network operation.
C	Installing application software to default

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configuration.

D Testing computer network operation.

E Identifying and rectifying interconnection faults.

F Shutting down a computer correctly.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

H Document procedures involved in performing tasks A to E.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling, setting up and testing personal computers.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Nil

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

A computing device could be a desktop, laptop, tablet, PDA, Smartphone or other device.

This unit shall be demonstrated in relation to assembling, setting-up, test and rectifying faults in a personal computer that can be connected to a simple local area network. Hardware fault rectification is confined to replacement of subassemblies and interconnections. Software fault rectification is confined to resetting default configuration and standard optimisation.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED103A Evaluate and modify object oriented code programs

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers evaluating and modifying programs based on object-oriented code. It encompasses safe working practices, following written and oral instruction and procedures, applying knowledge of object-oriented code scripting and testing and documenting outcomes.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED101A	Use basic computer applications relevant to a energy sector workplace
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to evaluate and modify programs written in object oriented code.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of program modification work is determined from job performance specifications and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Appropriate development kit and software are selected based on specified requirements and performance standard.
	1.6	Strategies are implemented to ensure programming is carried out efficiently.
2 Evaluate and modify programs written in object oriented code.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of computer function features are applied to object oriented programming.
	2.3	Correct syntax is applied to evaluating and

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ELEMENT	PERFORMANCE CRITERIA	
		modifying.
	2.4	Key features of the a object orientated programming language are applied to evaluation and modification. (See Note)
	2.5	Approaches to issues/problems are analysed to provide most effective solutions.
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
3 Test and document modified programs written in object oriented code.	3.1	Procedures are developed to test modified programming.
	3.2	Problems and bugs in code are rectified to ensure specification in the creation of the code is met.
	3.3	Intermediate and final work reports are written in accordance with professional standards, and presented to appropriate person(s).
		Note. Key features include object; class; instance; member data/fields; member attributes/methods and local variables.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and evaluating and modifying programs written in object oriented code.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED103A Basic object oriented programming

Evidence shall show an understanding of object orientated programming basics to an extent indicated by the following aspects:

T1 Object-Oriented programming language elements

T2 Object-Oriented programming language operators and control structure

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry

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and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Evaluate and modify programs written in object oriented code as described in 8) and including:

A Using key features of object oriented programming to evaluate and modify program.

B Modifying three programs' features.

C Developing testing procedures.

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D	Identifying problem and bugs in code.
E	Rectifying problem and bugs in code.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to evaluating and modifying programs written in object oriented code.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate

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the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to evaluating and modifying programs written in object oriented code, any object oriented programming language including the following features.

- Graphical User Interfaces
- Applets and graphics
- Exceptions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED104A Use engineering applications software on personal computers

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the use of computer application relevant to engineering support work functions. It encompasses applying user preferences, using application menus and tools, entering and retrieve information, working with groups and transferring and printing files.

Note:

Examples of engineering application software are Visio, Electronic Work Bench, Lab View, Network Simulator.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to use computer applications.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in relation to computer and keyboard use are followed.
	1.3	Application software and information required for use is obtained from appropriate sources.
	1.4	On-screen instructions in relation to any anomaly such as a virus warning are followed.
	1.5	Help menu is used to resolve any straightforward start up or access issues or anomalies.
2 Use engineering application software.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Techniques that apply to a particular software package are used to produce appropriate files.
	2.3	Routine checks are made to ensure accuracy of information in accordance with quality requirements.
3 Output information from an application.	3.1	Completed files are stored appropriately in accordance with enterprise requirements.
	3.2	Files are printed for formal records and/or forwarded to others.

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ELEMENT	PERFORMANCE CRITERIA	
4 Shut down computer.	4.1	Files are named, arranged, saved and backed up in accordance with enterprise requirements.
	4.2	Computer shutdown procedures are followed and computer switched off.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices using engineering application software.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED104A Personal computers, engineering applications software basic

Evidence shall show an understanding of object orientated programming basics to an extent indicated by the following aspects:

T1 Computer Systems Overview encompassing:

- Safety
- Applications of computers in industry
- Types of computer systems
- Hardware components
- Software and firmware
- Memory
- Peripherals
- Removable storage devices
- PC hardware inventory
- Networking

T2 Operating System Overview encompassing:

- Software layer model
- Function and characteristics of an operating system
- File structure
- Formatting disks
- Boot process
- Configuration files

T3 Windows Operating System encompassing

- Windows screen
- Windows Explorer
- File management
- Managing software, updates, backups and virus protection.

T4 Word Processors encompassing

- Word files
- Formatting

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REQUIRED SKILLS AND KNOWLEDGE

- Engineering symbols
- Tables and lists
- Drawings
- Spelling, grammar, and ‘search-and-replace’
- Printing

T5 Spreadsheets encompassing

- Parts of a spreadsheet
- Excel file management
- Inserting data into spreadsheets
- Formatting spreadsheets
- Charts
- Engineering problem solving
- Printing

T6 Databases encompassing:

- Features and purpose of database
- Searching existing database
- Creating a simple database
- Manipulating data in a database
- Advance sort functions
- Reports

T7 Transferring Data Between Windows Applications encompassing:

- Moving data between Word, Excel and Access

T8 Drawing and Computer Assisted Design (CAD) programs encompassing:

- Computer drawing using applications such as Visio.
- Incorporation of electrical/electronic symbols into computer drawings.

T9 E-mail and Internet Browsers encompassing:

- Browsers
- Search Engines
- Web-based e-mail (e.g. Hotmail)
- Application-based e-mail (e.g. Outlook).

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use engineering applications software as described in 8) and including:

A Following application instructions to input and output information.

B Storing information appropriately.

C Outputting information to a printer.

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D	Transferring information between systems.
E	Saving, storing and backing up files for effective retrieval by others.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to using engineering application software.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to using at least two of the following types of engineering applications at a basic level.

- Office Applications
- Computer Aided Design
- Engineering data analysis software
- Engineering modelling
- Project management
- Network simulator
- Protocol analyser

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Computer Systems

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UEENEED110A Set up, create and implement content for a web server

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation, set up, implementation and provision of on-going support of web services. It encompasses working safely, installing and administering server software and databases, server side scripting, configuring access and security and documenting work activities.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop and implement web based server.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of development work is determined from server performance specifications and in consultation with relevant persons.
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
		1.5	Appropriate development tools and software are selected based on specified requirements and performance standards.
		1.6	Strategies are implemented to ensure development work is carried out efficiently.
2	Develop web services.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Server software is installed and configured to ensure effective functionality and security. (See Note 1)
		2.3	Knowledge of syntax functions and features of mark-up languages scripts in current use are applied to developing client-side programming. (See Notes 2 and 3)

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ELEMENT		PERFORMANCE CRITERIA	
		2.4	Pages are created and rendered with relative and absolute links, images and table formatting using cascaded styles sheets.
		2.5	Forms are created with a variety of appropriate elements and element groupings to make forms easy to follow.
		2.6	Knowledge of server scripting languages in current use is applied to scripting to developing client-side programming and validations. (See Note 4)
		2.7	Scripts are written to provide web functionality and management of relation databases. (See Notes 5 and 6
		2.8	Scripts are written to provide web functionality and management of browser windows, security, web application deployment and administration consoles.
		2.9	A number of individual solutions are integrated to meet the specifications of a web application project.
		2.10	Approaches to issues/problems are analysed to provide most effective solutions.
		2.11	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
3	Test, evaluate, implement and document the developed web services.	3.1	Testing and procedures are developed to evaluate client-side programming and web applications and services.
		3.2	Problems and bugs in client-side programming, and web services functionality are identified and rectified to ensure specification are met.
		3.3	Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person(s).

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ELEMENT	PERFORMANCE CRITERIA
	Notes. 1. Examples of web software are Apache, IIS. 2. Examples of mark-up languages are HTML, XML and XSL. 3. Example of scripts are JavaScript and VB script. 4. Examples of server scripting languages are JSP, ASP, PHP and Perl 5. Examples of relational databases are SQL variants and Access 6. Examples of database connectivity components are ODBC, JDBC and ADO

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up and creating content for a web server.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED110A Web application server and services

Evidence shall show an understanding of the programming elements and web servers to an extent indicated by the following aspects:

T1 Algorithm Design encompassing:

- Problem Definition
- Steps in Problem-Solving
- Modular Design
- Top-Down Design
- Flow-Charts and Structured Programming
- Pseudo-Code
- Filtering allowable Data Input
- Using standard Input & Output methods
- Object-Oriented Design (brief intro.)
- Documentation Rationale
- Acceptable Documentation Method

T2 Machine-Code, Assemblers and Compilers

T3 Brief History of Languages & Limitations

T4 Parameters of different programming languages encompassing:

- Constants and variables
- Data types and declarations
- Logical flow control
- Detecting breaches of structure
- Documentation instruction examples
- Procedures and function calls
- Parameter-passing
- Local and global variables
- Object-oriented methods
- Classes and objects,
- encapsulation and inheritance.
- Visual programming methods
- General-purpose program libraries

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REQUIRED SKILLS AND KNOWLEDGE

T5 Data structures encompassing:

- Records
- Arrays
- File Input/output

T6 Testing and validation encompassing:

- Sequencing the process
- Inconsistencies detection

  Note, An examples is comparing code to documentation, commonly called “Desk-Checking'.
- Test data selection
- Modular testing & debug
- Problems with using non-standard methods for data input and output.
- Common bugs
- Comparison of HTTP servers and platforms

  Note.

  Examples include IIS and Apache

T7 Comparison of Application servers and platforms

Note.

Examples include J2EE / tomcat, .NET

T8 HTTP Servers encompassing:

- Installation requirements and methods
- Security configuration
- Content publishing and security

T9 WEB application technologies encompassing:

- Server installation and deployment
- Security

T10 Server scripting technologies encompassing:

- WEB application installation and deployment
- Application server administration

T11 Web services overview encompassing:

- WEB services XML, API, RPC
- XML API processing
- XML DOM
- SOAP (simple object access protocol)
- WEB Services Security

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up and create content for a web server as described in 8) and including:

A Interpreting server performance requirements.

B Identifying the appropriate development tools and software.

C Installing and configure web server software.

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D	Creating and rendering effective web pages.
E	Providing web functionality and management of relation databases.
F	Providing web functionality and management of browser windows, security, web application deployment and administration consoles.
G	Developing testing procedures.
H	Identifying problem and bugs in client-side programming and web services functionality.
I	Rectifying problem and bugs.
J	Writing intermediate and final work reports to the required standard.
K	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up and creating content in a web server.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to web and application servers and web services technology within a multi-tier client-server environment. This shall include:

- Development, implementation and testing HTML pages with at least four of the following features:
  - Relative and absolute links, images and table formatting
  - Cascaded styles sheets
  - Forms
  - New browser windows
  - Validation of form data
- Development, implementation and testing of server scripting for database access with at least four of the following features:
  - Form data input response
  - Form data processing
  - Database access
  - Output of database table contents
  - Insertion of table data to database
- Installation and administration of key features of Web and Web application servers

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED111A Develop, implement and test object oriented code

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers developing, implementing and testing object oriented programming solutions using object orientated programming language. It encompasses following development brief, using appropriate development software, writing code that features classes, inheritance, arrays, and advanced library components and documenting development activities.

Note:

This unit applies to all aspects of Electrotechnology - engineering applications only. For general competencies related Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED101A	Use basic computer applications relevant to a energy sector workplace
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop object oriented code.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of code development work is determined from job performance specifications and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	1.5	Appropriate development kit and software are selected based on specified requirements and performance standard.
	1.6	Strategies are implemented to ensure programming is carried out efficiently.
2 Develop code.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Correct syntax is applied when developing code.
	2.3	Key features of the object orientated programming language are applied to develop and test solutions. Note: Key feature include object; class; instance;

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ELEMENT	PERFORMANCE CRITERIA	
		member data/fields; member attributes / methods and variables.
	2.4	Code is written that features data encapsulation, inheritance and libraries.
	2.5	Approaches to issues/problems are analysed to provide most effective solutions.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test and document the development of object oriented code.	3.1	Testing procedures are developed to analyse code.
	3.2	Problems and bugs in code are rectified to ensure specifications are met.
	3.3	Intermediate and final documentation is written in accordance with professional standards and presented to appropriate person or persons.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing object oriented code.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED111A Object orientated programming

Evidence shall show an understanding of object orientated programming to an extent indicated by the following aspects:

T1 OO programming language elements

T2 OO programming language operators and control structures

T3 Creating new classes

T4 Using system libraries

Note: Examples may include:

System, Strings, String Buffer, Math and Wrapper classes.

T5 Inheritance encompassing:

- Inheritance and object orientated programming
- Support for inheritance
- Access modifiers and inheritance
- Overriding
- Use of this and super
- Inheritance and constructors
- Extending classes
- Interfaces
- Polymorphism and dynamic binding

T6 Defining and using arrays

T7 Creating Graphical User Interfaces (GUI) applications using library classes

T8 Using GUI components and event-driven programming

T9 Exception handling

T10 File I/O

T11 Collections and collection framework

T12 Multithreading

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop object oriented code as described in 8) and including:

A Using all key features of object oriented programming.

B Developing testing procedures.

C Identifying problems and bugs in code.

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D	Rectifying and documenting problems and bugs in code.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing object oriented code.

Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all

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necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing object oriented code will consist of multiple user-classes with each of the following items occurring on at least two occasions:

- Inheritance
- Arrays
- GUI Components
- Exceptions
- File/I/O
- Event handling

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Computer Systems

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UEENEED112A Support computer hardware and software for engineering applications

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers upgrading and maintaining computers, computer devices and peripherals and installing, maintaining and configuring software. It encompasses safe working practices, installing and testing the upgrading components, locating faults in hardware components, replacing faulty subsystems, installing and testing the operating system and application software, testing functionality, rectifying malfunctions, following written and oral instruction and procedures and applying appropriate customer relations.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 2 or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED102A	Assemble, Set Up and Test Computing Devices
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to upgrade and maintain computer hardware and software.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Appropriate person(s) are consulted to determine the nature of computer or peripheral hardware/software upgrading or maintenance.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others affected by the work.
	1.5	Hardware subsystems needed to upgrade or maintain computers and peripherals are obtained in accordance with established procedures and checked against job requirements. (See Note 1)

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Software versions are deployed in accordance with established procedures and checked against job requirements. (See Note 2)
2 Upgrade computer hardware and software.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Computers are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Computers and peripherals are dismantled as needed for upgrading in accordance with service manual instructions or industry practices, and parts stored to prevent loss or damage.
	2.4	Upgrading components are fitted and computer/peripheral apparatus is reassembled in accordance with service manual instructions or industry practices.
	2.5	Upgrading software components are installed and accordance with service manual instructions or industry practices.
	2.6	Operating system, including device drivers and application software are tested in preparation for return to service/customer. (See Note 3)
	2.7	Computer/peripheral apparatus is tested and prepared for return to customer.
3 Maintain operation of computer hardware and software.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	3.3	Computers are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	3.4	Computers and peripherals are dismantled as

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ELEMENT	PERFORMANCE CRITERIA	
		needed to find and rectify faults in accordance with service manual instructions and industry practices, and parts stored to prevent loss or damage.
	3.5	Faults are identified using logical techniques drawing on knowledge of computer/peripheral hardware components and measured values of operating parameters.
	3.6	Faulty components are rechecked and their fault status confirmed.
	3.7	Operating system malfunctions are identified using logical techniques drawing on knowledge of operating system configuration requirements.
	3.8	Device driver malfunctions are identified using logical techniques drawing on knowledge of device driver software configuration requirements.
	3.9	Application software malfunctions are identified using logical techniques drawing on knowledge of software configuration requirements.
	3.10	Malfunctions are rectified using latest software versions, incremental updates and bug and security patches.
	3.11	Computer hardware/peripheral device, operating system, including device drivers, and application software are tested in preparation for return to service/customer.
	3.12	Redundant files are removed and disposed of or archived in accordance with established procedures.
	3.13	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	3.14	Maintenance is carried out efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or other services.

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ELEMENT	PERFORMANCE CRITERIA	
4 Complete and report upgrading and maintenance activities.	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work area is cleaned and made safe in accordance with established procedures.
	4.3	Written justification is produced for hardware software upgrading and maintenance.
	4.4	Upgrading and maintenance is documented and appropriate person(s) notified in accordance with established procedures.

Note:

1. Example of materials are motherboards, processors and memory modules.

2. Example include complete version update, incremental (download) updates and security and bug patches.

3. Examples include Internet access, word processing, spreadsheet, graphics, publishing and industrial applications.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and supporting computers hardware and software.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED112A Computer peripherals and operating systems

Evidence shall show an understanding of computer peripherals and operating systems to an extent indicated by the following aspects:

T1 Types and applications of computer peripherals

T2 Operating principles of computer peripheral hardware

T3 Management of peripheral devices

T4 Operating system components and structure

T5 Operating system installation, upgrades and migration

T6 Operating system imaging and deployment

T7 Configuring hardware, device drivers, and applications

T8 Configuring network connectivity

T9 File structure and management

T10 Configuring file and folder access

T11 Authentication and authorisation

T12 Remote access

T13 Monitoring and maintaining an operating system using system tools

T14 Configuring backup and recovery options

T15 Operating system malfunctions and solutions

T16 Troubleshooting techniques

T17 Occupational health and safety fundamentals as they relate to computing device assembly/disassembly and computer operating systems.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
- Support computer hardware and software as described in 8) and including:
  - Upgrade a computer including:

A	Obtaining appropriate upgrading subsystems
B	Dismantling, fitting upgrading subsystems and reassembling correctly
C	Testing upgrade

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D Documenting upgrading activities

- Install and upgrade computer software on at least two occasions including:

E Identifying deployment or upgrade needs

F Installing and configuring operating system and applications software

G Testing upgraded software

H Documenting upgrade activities

- Maintain a computer and two external peripheral devices including:

I Testing and identifying faulty components

J Dismantling, fitting replacement components and reassembling correctly

K Testing maintenance repair

L Documenting maintenance activities

- Maintain computer software on at least two occasions including:

M Monitor and maintain the operating system and applications software

N Configure backup and recovery options

O Identifying operating system malfunctions

P Identifying device driver malfunctions

Q Identifying application malfunctions

R Rectifying software malfunctions

S Dealing with redundant files

T Documenting maintenance activities

U Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to support computers hardware and software.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to maintaining and upgrading the operating system, including device drivers and at least three application software types for a personal computer and server.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED113A Install and administer Unix based networked computers

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the installation and administration of UNIX based and networked computers. It encompasses safe working practices, performing basic UNIX, Linux or Mac OSX operating system installation, administration functions of logging in and out, setting up GUI applications, manipulating text files, creating and searching files and directories, changing permissions, using text editors, identifying and modifying initialization files, streamlining command, execution using shell features, using basic network commands and documenting all administration activities.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills **5)**

qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install, upgrade and maintain network operations.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the administration work is established from network specifications and in consultation with appropriate person(s).
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Unix system variants, versions and updates needed to maintain the computers and networks are identified and obtained in accordance with established procedures and checked against job requirements.

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ELEMENT	PERFORMANCE CRITERIA	
2 Install, upgrade and maintain Unix-based computers and network operations	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Unix operating system is installed upgraded and configured on computers and servers in accordance with developer's instructions and network requirements.
	2.3	Devices and drivers, desktop environment, network protocols and services and system security are implemented in accordance with requirements.
	2.4	Access to resources is configured within the limitations specified for each users.
	2.5	Unix-based network malfunctions are identified and rectified using logical techniques and drawing knowledge of devices and drivers, storage, basic network protocols, connections and services and system security configuration processes.
	2.6	Network performance and reliability is monitored and optimised in accordance with established procedures.
	2.7	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.8	Unix-based network administration is carried out efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or other services.
3 Document network administration activities.	3.1	Written justification is produced for network upgrading and maintenance and appropriate person(s) notified in accordance with established procedures.
	3.2	Network administration documentation are maintained in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing, configuring and administering Unix based computers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED113A Unix fundamentals and operating systems

Evidence shall show an understanding of computer operating systems Unix fundamentals, Mac OSX fundamentals to an extent indicated by the following aspects:

T1 Operating system components and structure

T2 System installation and configuration

Note.

System installation includes drivers and internet access and simple networking

T3 File structure and management

T4 System tools

Note:

Examples include control panels, wizards and the like

T5 Operating systems malfunctions and solutions

T6 Troubleshooting techniques.

T7 UNIX operating systems encompassing:

- Overview of basic function, components and concepts of computer systems and operating systems
- History of UNIX and flavours of UNIX
- UNIX administrators role

T8 Accessing UNIX and common desktop environment encompassing:

- User Accounts
- Desktop environment
- Customising using Style Manager
- Sub-panels

T9 Graphical User Interface (GUI) Applications encompassing:

- Using Mail Tool, Calendar Manager and other applications
- Using GUI help and other help systems
- Troubleshooting

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REQUIRED SKILLS AND KNOWLEDGE

T10 Accessing files and directories encompassing:

- File system structure and navigation
- Pathnames
- Listing directory contents
- Identifying and using meta-characters

T11 Directory and file management encompassing:

- Using Command Line
- Using File Manager

T12 File and user information utilities encompassing:

- File systems
- File processing commands
- Users
- Scripting

T13 File security encompassing:

- Overview of security concepts and functions
- Permissions
- Changing permissions with Command Line and File Manager

T14 Printing encompassing:

- Command line printing
- Print manager, print status and queue
- Printing from File Manager

T15 Backup and restoring data encompassing:

- Overview of back up and restoring strategies
- Using tar utility to perform file storage
- Compression tools
- Using jar command
- GUI backup tools

T16 System processes and memory management encompassing:

- Processes and PIDs
- Terminating a process
- Memory management

T17 Korn and C Shells encompassing:

- Overview of shell
- Korn Shell features
- C Shell Features
- Shell Feature Comparison

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REQUIRED SKILLS AND KNOWLEDGE

T18 Customisation encompassing:

- Overview of customisation
- Initialisation files
- Shell customisation
- GUI customisation

T19 Network Basics encompassing:

- Client – Server
- Network commands
- NIS+ and NFS+

T20 Mac OSX operating systems encompassing:

- System structure and component functions
- System Installation
- Setting user preferences
- T21 Security encompassing:
- Setting up multiple user accounts
- Role and function of Keychain

T22 Networking/internet set up procedures

T23 Onstalling applications software

T24 Installing and managing server software encompassing:

- Setting up servers for a variety of protocols
- Managing access

T25 Using ‘Terminal’

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and administer Unix based computers as described in 8) and including:

A Identify the Unix-based operating system variants, versions and updates required.

B Installing, upgrading and configuring computer operating system correctly.

C Configuring access to resources for each user.

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D	Identifying computer/network malfunctions.
E	Rectifying computer/network malfunctions.
F	Documenting computer/network administration activities.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and administering Unix based computers.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily

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intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing and configuring the operating system and administering at least two networked computers using at least one of UNIX, Linux or MacOSX operating systems

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED114A Design and manage enterprise computer networks

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers designing and managing enterprise computer networks. It encompasses safe working practices, the design and management of network and application services, core identity and access management components, directory services infrastructure components, designing physical and logical directory service topologies, designing a public key infrastructure (PKI), designing for business continuity and data availability, and documenting all design and management activities.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 6.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills **5)**

qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Develop design for an enterprise network.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent of the network to be designed is determined from design brief and/or in consultation with appropriate persons.
	1.3	Business requirements of the enterprise are analysed taking into account existing and projected business model, organisational and Information Technology management structures.
	1.4	Consideration is given to factors that will have an impact on the design such as business priorities, growth, growth strategy, regulatory framework, risk, and cost.
	1.5	Existing and planned technical and environment goals of the enterprise are evaluated and documented. (See Note 1)
	1.6	Consideration is given to technical factors that will have an impact on the design. (See Note 2)
	1.7	Client access and end-user needs and usage patterns and disaster recovery requirements are evaluated and documented.

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ELEMENT	PERFORMANCE CRITERIA	
	1.8	Design specification is written using information obtained from the analysis and evaluations of enterprise business and technical requirements.
	1.9	Network specification is presented and discussed with person(s) of higher authority.
	1.10	Alterations to the network specification resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
2 Design an enterprise network.	2.1	Knowledge and complexities of alternative network infrastructures and currently available technologies are applied to network design. (See Note 3)
	2.2	Network design is developed to incorporate all required Wide Area Network (WAN) infrastructure, Internet connectivity and implementation and management strategies.
	2.3	Risk management strategies are sought and obtained for incorporating into the network design.
	2.4	Network design is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Network design proposal is documented in accordance with organisation policies and procedures.
	2.6	Network design is presented and discussed with person(s) of higher authority.
	2.7	Alterations to the network design resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
	2.8	Final design is documented and approval obtained from appropriate person(s).

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ELEMENT	PERFORMANCE CRITERIA	
3 Implement and manage an enterprise network.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Server and client computer hardware are installed and configures in compliance with design specifications and network industry standards. (See Note 4)
	3.3	User and Group objects are created and group policy implemented. (Notes 5 and 6)
	3.4	Directory services, data storage, shared resources Internet information services, remote access and network security are managed to ensure effective operation of the network. (Notes 7 to 11)
	3.5	Approaches to issues/problems are analysed to provide most effective solutions.
	3.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
4 Diagnose network malfunctions.	4.1	OHS risk control measures and procedures for carrying out the work are followed.
	4.2	Network operation is monitored and malfunctions are diagnosed to ascertain their cause using network diagnostic tools. (Note 12)
	4.3	Network malfunctions are rectified using effective techniques and drawing knowledge of network topology and complexities of network interactivity.
	4.4	Approaches to issues/problems are analysed to provide most effective solutions.
	4.5	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

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ELEMENT	PERFORMANCE CRITERIA
5 Report network management activities.	5.1 Written justification is produced for enterprise network services solutions and forwarded to appropriate person/s in accordance with established procedures.
	5.2 Network service development records are maintained in accordance with established procedures.

Notes.

1. Examples are company size, user and resource distribution, various site connectivity, bandwidth, service performance, availability and scalability, data and system access patterns, network roles and responsibilities and security considerations

2. Examples are currently available resources, services, network infrastructure, protocols and hosts, Transmission Control Protocol and Internet Protocol hardware, planned upgrades, support and network and systems management.

3. Examples of network infrastructure are topology, TCP/IP networking strategy, DHCP strategy, Design of name resolution services, Multi-protocol strategy and Distributed File Strategy

4. Hardware installation includes using qualified tools, driver signing options, digital signatures on driver files and systems support for legacy hardware devices.

5. Example of user and group objects are computer accounts, groups configuring accounts via a directory service, searching for objects, use of templates for creating user accounts and resetting accounts

6. Examples of group policy implementation are deploying software, updates and assigning and publishing applications.

7. Examples of directory services are publishing resources, performing searches and configuring printer objects

8. Examples of data storage are NTFS and FAT file systems such as New Technology File Systems (NTFS) and File Allocation Table (FAT), quotas, Encrypting File Systems, configuring volumes and basic and dynamic disks, file and folder permissions and compression and domain-based distributed file systems.

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ELEMENT	PERFORMANCE CRITERIA
	9. Examples of shared resources are folders, web sharing, folder permissions, printers and printer permissions.
	10. Examples of Internet Information Services are virtual directories and servers, Internet and intranet browsing, authentication and Secure Sockets Layer (SSL), File Transfer Protocol (FTP) services and access permissions for intranet server
	11. Examples of Network security are user account lockout settings, password management, Group Policy to run logon scripts and link objects, auditing and security log file.
	12. Examples of network operations are routing TCP/IP, DHCP, Domain Name Service, name resolution, starting servers, client computers, User and group objects, directory service replication problems, End-User Group Policy and remote access.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe work practices and designing and managing enterprise networks.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED114A Design and manage enterprise computer networks

Evidence shall show an understanding of enterprise computer network design and management processes to an extent indicated by the following aspects:

T1 Analyse business requirements:

- Existing and planned business model and organisational structure
- Factors impacting on design decisions

T2 Analyse technical requirements:

- Evaluation of the company's existing and planned technical and environmental goals
- Client access, end user work needs and usage patterns
- Disaster recovery options

T3 Plan for network and application services

- Name resolution
- IP addressing
- Network access policies
- Remote access strategies
- Support for legacy clients
- Application virtualisation
- Locally installed software
- Web based applications
- Terminal services licensing
- Remote desktop services infrastructure

T4 Design and manage directory service identity and management components

- Directory service logical components
- Directory service functional levels
- Intra-organisational authorisation and authentication
- Schema modifications
- Directory service physical topologies
  - Placement of servers

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REQUIRED SKILLS AND KNOWLEDGE

- Definition of physical site boundaries
- Site replication parameters
- Printer location policies
- Directory service administrative model
  - Delegation of administration
  - Group strategies
  - Compliance auditing
  - Group administration
  - Organisational structure
- Enterprise level policy strategy
- Directory service logical component migration strategies
- Directory service upgrade and restructuring
- Cross component authentication
- Backwards compatibility
- Implementation planning
- Environmental preparation
- Branch office deployment
  - Authentication strategies
  - Server security
- Implement a public key infrastructure (PKI)
- Plan for interoperability
  - Inter-organisational authorisation and authentication
  - Application authentication interoperability
  - Cross platform interoperability

T5 Design and manage business continuity and data availability

- Plan for business continuity
  - Service availability
  - Directory service recovery
- Software updates
- Compliance management
- Patch management strategies
- Operating system virtualisation strategies
  - Server consolidation
  - Application compatibility
  - Virtualisation management
  - Placement of servers
- Data management and data access
  - Data security

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REQUIRED SKILLS AND KNOWLEDGE

- Data accessibility
- Redundancy
- Data collaboration

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and manage enterprise networks as described in 8)

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and including:

A	Analysing business requirements.
B	Analysing technical requirements.
C	Obtaining approval for network design specification.
D	Designing a practical network in compliance with specifications and industry standards.
E	Implementing network design.
F	Diagnosing and rectifying the cause of network malfunctions effectively.
G	Documenting justification for network solutions.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to design and management of enterprise computer networks.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation design and management of any enterprise network consisting of multiple sites and users and is to provide users with email and Internet access, shared resources and security.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Computer Systems

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UEENEED115A Administer computer networks

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the administration of network servers. It encompasses safe working practices, planning server installations and upgrades, planning for infrastructure services roles, establishing and maintaining user and group permissions, planning for remote administration, delegated administration, network security and shared resource management, monitoring and maintaining servers for performance evaluation and optimisation, terminal server infrastructure, application deployment, planning for business continuity and high availability, and documenting all administration activities.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED124A	Integrate multiple computer operating systems on a client server network
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install, upgrade and maintain network operations.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the network is established from network specifications and in consultation with appropriate person(s).
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Network operating system versions and updates needed to maintain the network are obtained in accordance with established procedures and checked against job requirements. (See Note 1)

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ELEMENT	PERFORMANCE CRITERIA	
2 Install, upgrade and maintain network operations.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Server operating systems in current use are installed and upgraded and configure in accordance with developer's instructions and network requirements. (See Note 2)
	2.3	Devices and drivers, desktop environment, network protocols and services and system security are implemented in accordance with requirements.
	2.4	Access to resources is configured within the limitations specified for each users.
	2.5	Network malfunctions are identified and rectified using logical techniques and drawing knowledge of devices and drivers, storage, network protocols, connections and services and system security configuration processes.
	2.6	Network performance and reliability is monitored and optimised in accordance with established procedures.
	2.7	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.8	Network administration is carried out efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or other services.
	2.9	Written justification is produced for network maintenance and upgrading and appropriate person(s) notified in accordance with established procedures.
3 Document network administration activities.	3.1	Network administration documentation are maintained in accordance with established procedures.
	3.2	OHS procedures for a given work area are identified, obtained and understood.

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ELEMENT	PERFORMANCE CRITERIA
	Notes: 1. Examples may include new deployment, complete version upgrade, incremental updates, and security and bug patches. 2. Examples of operating systems include Windows Server 2008, Mac OS X Server, Unix and Linux variants. 3. Examples of optimising network performance include implementing a patch management strategy, monitoring servers for performance evaluation and optimisation, removal of redundant components and maintaining storage capacity, and monitoring and maintaining security and policies.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and administering user networks.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED115A Administer computer networks

Evidence shall show an understanding of administering computer networks to an extent indicated by the following aspects:

T1 Server deployment encompassing:

- Operating system edition selection
- Roll back planning
- Encryption implementation requirements
- Attended installations
- Hardware device driver installation and configuration
- Installation, configuration and troubleshooting of peripheral I/O devices
- Automated server deployment
- Address assignment
- Name resolution
- Infrastructure services server rolls:
  - Address assignment
  - Name resolution
  - Network access
  - Directory services
  - Application services
  - Certificate services
- Application servers and services
  - Virtualisation server planning
  - Server availability
  - Server resilience
  - Server accessibility
- File and print server roles
  - Access permissions
  - Storage quotas
  - Replication
  - Indexing

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REQUIRED SKILLS AND KNOWLEDGE

- File storage policies
- Server availability
- Printer availability

T2 Server management encompassing:

- Remote administration
- Remote desktop
- Server management technologies
- Delegation policies and procedures
- Delegation of administration of directory service objects
- Application management
- Planning and implementing policy strategies

T3 Monitoring and maintaining servers encompassing:

- Operating system patch level maintenance
- Server update services
- Application patch level maintenance
- Server and service monitoring, optimisation, event management, trending and baseline analysis
- Remote access
- Network access
- Server security
- Firewall rules and policies
- Authentication and authorisation, data security, and auditing

T4 Application and data provisioning encompassing:

- Virtualisation
- Terminal server infrastructure
- Resource allocation
- Application virtualisation alternatives
- Application deployment
- Shared resources
- Off line data access

T5 Business continuity and high availability:

- Storage solutions
- Storage management
- Service redundancy
- Service availability
- Data recovery strategy
- Server recovery strategy
- Directory service recovery strategy

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REQUIRED SKILLS AND KNOWLEDGE

- Object level recovery

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to

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safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Administer user networks as described in 8) and including:

A Establishing network requirements and operating

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system versions and updates, including infrastructure, applications, file and print server services roles.

B Installing, upgrading and configuring server operating system correctly as per network requirements.

C Define server management strategies, delegated administration, and policy strategies

D Monitor and maintain servers including implementing a patch management strategy, monitoring for performance evaluation and optimisation and monitor and maintain security and policies

E Identifying and rectifying network malfunctions.

F Provision applications and data, including virtualisation, resource allocation, application deployment, shared resources and off-line data access

G Plan storage solutions, high availability, and backup and recovery

H Documenting network administration activities.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to administering user networks.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to administering computer networks, including planning for server deployment, server management, monitoring and maintaining servers, planning application and data provisioning and planning for business continuity and high availability.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Computer Systems

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UEENEED116A Develop computer network services

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing services for network clients to support access to network resources. It encompasses safe working practices, configuring IPv4 and IPv6 addressing, installing and configuring name resolution using Domain Name Server (DNS), Dynamic Host Configuration Protocol (DHCP), configuring routing and firewalls, configuring remote access and authentication services, file and print services, update services, performance monitoring, data collection services, and documenting development activities.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills	**5)** qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop network services.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of network services to be developed is determined from network performance specifications and in consultation with relevant persons.
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
		1.5	Appropriate development tools and software are selected based on specified requirements and performance standard.
		1.6	Strategies are implemented to ensure network development is carried out efficiently.
2	Install, configure and manage network services.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge and complexities of network

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ELEMENT	PERFORMANCE CRITERIA	
		infrastructure are applied to developing network services.
	2.3	Network infrastructure components in current use and installed and configured in compliance with industry standards and variants as specified for the network. (See Note 1)
	2.4	Management components of network services are configured in compliance with industry standards and requirements specified for the network. (See Note 2)
	2.5	Security components of network services are created in compliance with current industry standards and requirements specified for the network.
	2.6	Network malfunctions are identified and rectified using logical techniques and drawing knowledge of complex network infrastructure.
	2.7	Network is monitored and solutions are developed to optimise network performance and reliability in accordance with established procedures.
	2.8	Approaches to issues/problems are analysed to provide most effective solutions.
	2.9	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
3 Report network administration activities	3.1	Written justification is produced for network services development activities and appropriate person/s notified in accordance with established procedures.
	3.2	Network service development records are maintained in accordance with established procedures.

Notes.

1. Examples of network infrastructure components may include DNS, DHCP, Remote Access, Network Protocols, IP Routing and WINS

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ELEMENT	PERFORMANCE CRITERIA
	2. Examples of management components may include Management Consoles, Server Manager, and Remote administration tools.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing network services.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED116A Develop computer network services

Evidence shall show an understanding of network services to an extent indicated by the following aspects:

T1 IPv4 and IPv6 addressing

- Configure IP address options
- Subnetting and supernetting
- Interoperability between IPv4 and IPv6

T2 Domain Name Service (DNS) encompassing:

- Install and configure a DNS Server Service
- Configuring Zones, DNS records and replication
- Configuring DNS clients

T3 Dynamic Host Configuration Protocol (DHCP)

- Installation of a DHCP Server Service
- DHCP server options and scopes
- DHCP relay agents
- Exclusions and reservations
- DHCPv6

T4 Configure routing and firewalls

- Routing protocols
- Maintaining routing tables
- Demand dial routing
- Inbound and outbound and custom firewall rules
- IPSec policies

T5 Remote access

- Remote access policies
- Network Address Translation (NAT)
- VPN protocols
- Authentication policies and protocols

T6 File and print services

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REQUIRED SKILLS AND KNOWLEDGE

- Configure a file server, including file system permissions and encryption methodologies
- Configure backup and restore
- Manage file server resources
- Configure and print services monitor

T7 Monitor and maintain network services

- Configure update services
- Configure performance monitoring
- Configure event logs
- Gather network data

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

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access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop network services as described in 8) and including:

A	Establishing network services to be developed.
B	Installing and configuring network infrastructure components.
C	Configuring management components of network services.
D	Creating security components of network services.
E	Identifying and rectifying network malfunctions.
F	Developing solutions to optimise network performance.
G	Documenting network services development activities.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

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Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing network services.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation developing and managing services for any network that is to provide clients with email and Internet access, shared resources and security.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED117A Install and configure network systems for internetworking

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers the interconnection of networks. It encompasses safe working practice, basic installation and configuration of routers and documenting installation and configuration activities.

Note:
This unit applies to all aspects of Electrotechnology - engineering applications only. For general competencies related Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

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License to practice **3)**

and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and configure internetworking systems.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of internetworking to be installed and configured is determined from internetworking performance specifications and in consultations with relevant persons.
	1.4	Media and software required for internetworking is selected in accordance with organisation's established procedures.
	1.5	Network cabling test reports are obtained and reviewed to determine whether it complies with the required regulatory and performance standard.
	1.6	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	1.7	Appropriate development tools and software are selected based on specified requirements and performance standard.
	1.8	Strategies are implemented to ensure network development is carried out efficiently.

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ELEMENT	PERFORMANCE CRITERIA	
2 Install and configure internetworking systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of internetworking arrangements, subnetting and routing protocols are applied to installing and configuring routers and TCP/IP addresses.
	2.3	Routing protocols are selected and configured as per requirements specified for the internetworking systems.
	2.4	Common routing, TCP/IP and access malfunctions are identified and rectified using known solutions drawing knowledge of basic internetworking arrangements and protocol.
	2.5	Approaches to issues/problems are analysed to provide most effective solutions.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Report install and configuring of internetworking systems.	3.1	Written justification is made for internetworking installation and configuring activities and appropriate person/s notified in accordance with established procedures.
	3.2	Network services records are maintained in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and configuring networking systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED117A Internet Networks

Evidence shall show an understanding of network basics to an extent indicated by the following aspects:

T1 Calculate subnet addresses and masks

T2 Layer 3 and 4 Protocols

T3 Static and dynamic routing

T4 Basic Router Configuration

T5 Router Security

T6 Router Boot Sequence

T7 Router operating system management

T8 Password Recovery

T9 Router components and interfaces

T10 Troubleshooting at all layers

T11 Interior and Exterior routing protocols

T12 Distance vector routing protocols

T13 Link state routing protocols

T14 Routing tables

T15 Metrics used by routing protocols to find routes

T16 Advantages and disadvantages of distance vector and link state routing protocols

T17 Route summarisation

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and configure networking systems as described in 8) and including:

A Establishing the extent of internetworking installation.

B Selecting appropriate internetworking media and software.

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C	Determining whether network cabling is compliant.
D	Installing and configuring basic routing and TCP/IP protocols.
E	Calculate variable length subnet mask as per requirements specified for the internetworking systems.
F	Identifying common routing, TCP/IP and access malfunctions.
G	Applying known solutions to common routing, TCP/IP and access malfunctions.
H	Documenting internetworking installation and configuration activities.
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific

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resources for assessment, evidence should show demonstrated competency in installing and configuring networking systems.

Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to installing and configuring internetworking systems between two Local Area Networks (LANs) to form a Wide Area Network (WAN) or a LAN and the Internet.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED118A Design and implement network systems for internetworking

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers the design, implementation and performance monitoring of internetworking systems. It encompasses safe working practice, evaluating customer requirements, applying sound design principles, using Wide Area Network (WAN) technologies, complying with regulation and standards, and documentation of design and performance monitoring.

Note:

This unit applies to all aspects of Electrotechnology - engineering applications only. For general competencies related Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not

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License to practice **3)**

require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design internetworking systems.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Design brief for the internetworking is developed and documented in consultations with person(s) of higher authority.
	1.4	Work team/group is arranged of appropriately competent persons in accordance with skills required to meet work outcomes and organisation's established procedures.
	1.5	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	1.6	Strategies are implemented to ensure network development is carried out efficiently.
2 Design internetworking systems.	2.1	Internetworking system is designed to comply with design brief and consideration of economical and appropriately effective design solutions.
	2.2	Switching, routing and WAN technologies are included in the internetworking system design.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Internetworking system design includes specification of required media that is compliant with industry standards.
	2.4	Internetworking system design is documented in accordance with organisation's policies and procedures.
	2.5	Internetworking system design is presented and discussed with person(s) of higher authority.
	2.6	Alterations to the internetworking system design resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
	2.7	Final internetworking system design is documented and approval obtained from person(s) of higher authority.
3 Implement internetworking systems.	3.1	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	3.2	Appropriate development tools and software are selected based on specified requirements and performance standard.
	3.3	Knowledge of internetworking arrangements and protocols is applied to installing, configuring and testing switching, routing and WAN technologies.
	3.4	System malfunctions are identified during testing and rectified using logical techniques drawing knowledge of internetworking arrangements and protocol.
	3.5	Approaches to issues/problems are analysed to provide most effective solutions.
	3.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
	3.7	Final internetworking system design and implementation are documented in accordance

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ELEMENT	PERFORMANCE CRITERIA
	organisation's established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing and implementing internetworking systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED118A **Internet, local and wide area networks**

T1 Basic Switch Configuration

T2 Basic VLAN Configuration

T3 VLAN Design

T4 Configure Inter VLAN routing

T5 Configure VLAN trunking protocol

T6 Configure Spanning Tree Protocol

T7 Network Security and Risk Management

T8 Network Performance Assessment

T9 Wireless LAN Configuration:

- Wireless LAN Standards
- Wireless LAN Operation
- Troubleshoot Wireless LAN

T10 LAN Design

T11 Design Report Presentation

T12 Wide Area Networks (WANs) Technologies

T13 WAN Design

T14 WAN Protocols including Authentication

T15 WAN Management and Security

T16 Interior Gateway Protocol (IGP) Configuration

T17 Access Lists configuration

T18 Network Address Translation

T19 Configure DHCP Service

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and implement internetworking systems as described in 8) and including:

A Developing an internetworking system design brief.

B Planning work activities including requirements for work team/group.

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C	Designing internetworking system based on economic and effective solutions that meet with design brief requirements.
D	Detailing switching, routing and WAN technologies and specification for internetworking media in the design.
E	Documenting and presenting design for approval.
F	Implementing internetworking system design.
G	Identifying and rectifying system malfunctions.
H	Documenting internetworking installation and configuration activities.
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing and implementing internetworking systems.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED119A	Design and implement Internetworking systems — advanced routing
UEENEED120A	Design and implement Internetworking systems — remote access
UEENEED121A	Design and implement Internetworking systems — multi-layer switching
UEENEED122A	Design and implement Internetworking systems — security
UEENEED123A	Design and implement Internetworking systems — wireless LANs/WANs

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to designing and implementing internetworking systems between two Local Area Networks (LANs) to form a Wide Area Network (WAN) or a LAN and the Internet.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Computer Systems

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UEENEED119A Design and implement advanced routing for internetworking systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design, implementation and performance monitoring of Internetworking systems. It encompasses safe working practice, evaluating customer requirements, applying sound design principles, complying with regulation and standards, incorporation and advance configuration of remote access and documentation of design and performance monitoring.

Note:
This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design Internetworking systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Design brief for the advanced routing is developed and documented in consultation with person(s) of higher authority.
	1.4	Work team/group is arranged of appropriately competent persons in accordance with skills required to meet work outcomes and organisation’s established procedures.
	1.5	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.6	Strategies are implemented to ensure network development is carried out efficiently.
2 Design Internetworking systems.	2.1	Internetworking system is designed to comply with design brief and consideration of economical and appropriately effective design solutions.
	2.2	Advanced routing technologies are included in the Internetworking system design. (See Note)
	2.3	Internetworking system design includes specification of required media that is compliant with industry standards.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Internetworking system design is documented in accordance with organisation policies and procedures.
	2.5	Internetworking system design is presented and discussed with person(s) of higher authority.
	2.6	Alterations to the Internetworking system design resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
	2.7	Final Internetworking system design is documented and approval obtained from person(s) of higher authority
3 Implement Internetworking systems.	3.1	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	3.2	Appropriate development tools and software are selected based on specified requirements and performance standard.
	3.3	Knowledge of Internetworking arrangements and protocols is applied to installing, configuring and testing advance routing technologies.
	3.4	System malfunctions are identified during testing and rectified using logical techniques drawing knowledge of Internetworking arrangements and protocol.
	3.5	Approaches to issues/problems are analysed to provide most effective solutions.
	3.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
	3.7	Final Internetworking system design and implementation are documented in accordance organisation's established procedures.
	Note.	
	Examples of advanced routing technologies are scalable IP addresses, technologies to redistribute and support	

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ELEMENT	PERFORMANCE CRITERIA
	multiple, advanced, IP routing protocols such as OSPF, EIGRP, and BGP, access lists (security) and edge router connectivity into BGP networks

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing and implementing Internetworking systems - advanced routing.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED119A Advanced routing methods and protocols

Evidence shall show an understanding of routing methods and protocols to an extent indicated by the following aspects

T1 The Routing Process

- Routing table establishment
- Routing advertisement methods

T2 Scalable Internet Protocol (IP) addresses encompassing:

- Scaling with IPv4
- Variable Length subnet Mask (VLSM) and supernetting
- IPv6
- Network Address Translation (NAT) and Port Address Translation (PAT)

T3 Routing protocols in current use.

Note.

1. Examples include Routing Information Protocol (RIPv2), Enhanced Interior Gateway Protocol (EIGRP), Open Shortest Path First (OSPF) covering single, multi and NBMA areas and Virtual links, On-Demand Routing (ODR), Border Gateway Protocols (BGP) covering applications, communities, peer groups and route reflectors.

2. Other relevant routing protocols may be included.

T4 Multi-protocol routing encompassing:

- Static and floating static routes
- Route optimisation
- Route redistribution
- Route filtering

T5 Default route

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and implement Internetworking systems – advanced routing as described in 8) and including:

A Developing a design brief for advance routing in a Internetworking system.

B Planning work activities including requirements for work team/group.

C Designing advanced routing based on economic

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	and effective solutions that meet with design brief requirements
D	Detailing advanced routing technologies and specification for Internetworking media in the design.
E	Documenting and presenting design for approval.
F	Implementing Internetworking system design.
G	Identifying and rectifying system malfunctions.
H	Documenting Internetworking installation and configuration activities.
I	Detail technologies and media specifications used in the design of advanced wireless LANs technologies.
J	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing and implementing

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Internetworking systems – advanced routing.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED118A	Design and implement Internetworking systems
UEENEED120A	Design and implement Internetworking systems — remote access
UEENEED121A	Design and implement Internetworking systems — multi-layer switching
UEENEED122A	Design and implement Internetworking systems — security
UEENEED123A	Design and implement Internetworking systems — wireless LANs/WANs

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing and implementing Internetworking systems - advanced routing between two Local Area Networks (LANs) to form a Wide Area Network (WAN) or a LAN and the Internet.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED120A Design and implement remote access for Internetworking systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the design, implementation and performance monitoring of Internetworking systems. It encompasses safe working practice, evaluating customer requirements, applying sound design principles, complying with regulation and standards, incorporation and advance configuration of remote access and documentation of design and performance monitoring.

Note:
This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design Internetworking systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Design brief for the advanced remote access is developed and documented in consultation with person(s) of higher authority.
	1.4	Work team/group is arranged of appropriately competent persons in accordance with skills required to meet work outcomes and organisation's established procedures.
	1.5	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.6	Strategies are implemented to ensure network development is carried out efficiently.
2 Design Internetworking systems.	2.1	Internetworking system is designed to comply with design brief and consideration of economical and appropriately effective design solutions.
	2.2	Advanced remote access technologies are included in the Internetworking system design. (See Note)
	2.3	Internetworking system design includes specification of required media that is compliant

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ELEMENT	PERFORMANCE CRITERIA	
		with industry standards.
	2.4	Internetworking system design is documented in accordance with organisation policies and procedures.
	2.5	Internetworking system design is presented and discussed with person(s) of higher authority.
	2.6	Alterations to the Internetworking system design resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
	2.7	Final Internetworking system design is documented and approval obtained from person(s) of higher authority.
3 Implement Internetworking systems.	3.1	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	3.2	Appropriate development tools and software are selected based on specified requirements and performance standard.
	3.3	Knowledge of Internetworking arrangements and protocols is applied to installing, configuring and testing advance routing technologies.
	3.4	System malfunctions are identified during testing and rectified using logical techniques drawing knowledge of Internetworking arrangements and protocol.
	3.5	Approaches to issues/problems are analysed to provide most effective solutions.
	3.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
	3.7	Final Internetworking system design and implementation are documented in accordance organisation's established procedures.
	Note.	

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ELEMENT	PERFORMANCE CRITERIA
	Examples of advanced remote access technologies are asynchronous connections, Point-to-Point Protocol (PPP) architecture, protocol, call back, and compression ISDN architecture, protocol layers, BRI and DDR and X.25, Frame Relay, and AAA.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing and implementing Internetworking systems - remote access.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED120A Networks, remote access

Evidence shall show an understanding of remote access to networks to an extent indicated by the following aspects:

T1 Network devices and feature sets used for remote access networks encompassing:

- Typical Wide Area Networks (WAN) service.
- Devices for interfacing to WAN services
- Features of WAN services
- Required network device feature sets for effective WAN connectivity

T2 Asynchronous On-Demand WAN services encompassing:

- Asynchronous vs. synchronous services.
- Configuring asynchronous Connections with modems
- Interfacing hosts and modems
- Configuring Point-to-point Protocols (PPP) and related network access with Password Authentication Protocols (PAP) and Challenge Hand Shake Authentication Protocols (CHAP)

T3 Synchronous and leased WAN connectivity encompassing:

- Current industry-standard WAN services

  Note.

  Examples include X.25, ISDN and Frame Relay
- Configuring remote connections
- Configuring dial-on-demand routing.
- Traffic Flow
- Configuring backup links
- Managing network performance with queuing and compression

T4 Scaling remote access networks with Network Address Translation (NAT) and Port Address Translation (PAT)

T5 Controlling corporate network access

- Router-based access control (like access-control lists, reflexive access control, context-bases access control)

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REQUIRED SKILLS AND KNOWLEDGE

- Configuring access, authentication and accounting control systems using current current industry standard tools.

  Note.

  Example of current industry standard tools is Remote Authentication Dial-In User Service (RADIUS)

T6 Troubleshooting the remote access network.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and implement Internetworking systems – remote access as described in 8) and including:

A Developing a design brief for advanced remote access technologies in an Internetworking system.

B Planning work activities including requirements for work team/group.

C Designing Internetworking system based on

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	economic and effective solutions that meet with design brief requirements
D	Detailing advanced remote access technologies and specification for Internetworking media in the design.
E	Documenting and presenting design for approval.
F	Implementing Internetworking system design.
G	Identifying and rectifying system malfunctions.
H	Documenting Internetworking installation and configuration activities.
I	Detail technologies and media specifications used in the design of advanced wireless LANs technologies.
J	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing and implementing

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Internetworking systems – remote access.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED118A	Design and implement Internetworking systems
UEENEED119A	Design and implement Internetworking systems — advance routing
UEENEED121A	Design and implement Internetworking systems — multi-layer switching
UEENEED122A	Design and implement Internetworking systems — security
UEENEED123A	Design and implement Internetworking systems — wireless LANs/WANs

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation the designing and implementing internetworking system - remote access technologies in an Internetworking system between two Local Area Networks (LANs) to form a Wide Area Network (WAN) or a LAN and the Internet.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED121A Design and implement multi-layer switching for Internetworking systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the design, implementation and performance monitoring of Internetworking systems. It encompasses safe working practice, evaluating customer requirements, applying sound design principles, complying with regulation and standards, incorporation and advance multi-layer switching technologies access and documentation of design and performance monitoring.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not

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License to practice **3)**

require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design Internetworking systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Design brief for the advance multi-layer switching technologies is developed and documented in consultation with person(s) of higher authority.
	1.4	Work team/group is arranged of appropriately competent persons in accordance with skills required to meet work outcomes and organisation's established procedures.
	1.5	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.6	Strategies are implemented to ensure network development is carried out efficiently.
2 Design Internetworking systems.	2.1	Internetworking system is designed to comply with design brief and consideration of economical and appropriately effective design solutions.
	2.2	Advance multi-layer switching technologies are included in the Internetworking system design.

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ELEMENT	PERFORMANCE CRITERIA	
		(See Note)
	2.3	Internetworking system design includes specification of required media that is compliant with industry standards.
	2.4	Internetworking system design is documented in accordance with organisation policies and procedures.
	2.5	Internetworking system design is presented and discussed with person(s) of higher authority.
	2.6	Alterations to the Internetworking system design resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
	2.7	Final Internetworking system design is documented and approval obtained from person(s) of higher authority.
3 Implement Internetworking systems.	3.1	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	3.2	Appropriate development tools and software are selected based on specified requirements and performance standard.
	3.3	Knowledge of Internetworking arrangements and protocols is applied to installing, configuring and testing advance routing technologies.
	3.4	System malfunctions are identified during testing and rectified using logical techniques drawing knowledge of Internetworking arrangements and protocol.
	3.5	Approaches to issues/problems are analysed to provide most effective solutions.
	3.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
	3.7	Final Internetworking system design and implementation are documented in accordance

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ELEMENT	PERFORMANCE CRITERIA
	organisation's established procedures.
	Note.
	Examples of multi-layer switching technologies are, Fast Ethernet, Gigabit Ethernet, VLAN basics, types, identification, and trunking protocol, Spanning Tree Protocol, MLS processes, and configuration and multicasting protocols and routing.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing and implementing Internetworking systems - multi-layer switching.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED121A Multi-layer switched networks

Evidence shall show an understanding of multi-layer switched networks to an extent indicated by the following aspects:

T1 Campus network design encompassing:

- core layer
- distribution layer
- access layer
- selection of appropriate devices
- defining workgroups

T2 Managing Redundant Links encompassing:

- Spanning Tree Protocols (STP)
- Controlling STP in redundant environments
- STP in Virtual Local Area Network (VLAN) environments
- Configuring redundant routing protocols for a fault-tolerant routing

  Note.

  An example is Hot Standby routing protocol (HSRP)

T3 Fast layer 2 services encompassing:

- Fast Ethernet
- Trunking
- Fast Ether channels
- Gigabit services

T4 Inter VLAN Routing encompassing:

- Hardware vs. Software switching
- Overview of fast switching technologies
- Elements of a multi-layer switch
- Configuring multi-layer switches

T5 Multicast encompassing:

- Multi-cast group management
- Configuring multi-cast control at layer 2

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REQUIRED SKILLS AND KNOWLEDGE

- Configuring multi-cast control at layer 3

T6 Controlling Access to the Campus Network

T7 Managing Network Traffic

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

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Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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- Design and implement Internetworking systems – multi-layer switching as described in 8) and including:

A	Developing a design brief for multi-layer switching technologies in an Internetworking system
B	Planning work activities including requirements for work team/group
C	Designing Internetworking system based on economic and effective solutions that meet with design brief requirements
D	Detailing multi-layer switching technologies and specification for Internetworking media in the design
E	Documenting and presenting design for approval
F	Implementing Internetworking system design
G	Identifying and rectifying system malfunctions
H	Documenting Internetworking installation and configuration activities
I	Detail technologies and media specifications used in the design of advanced wireless LANs technologies.
J	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing and implementing Internetworking systems – multi-layer switching.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency

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development in this unit may be arranged concurrently with unit:

UEENEED118A	Design and implement Internetworking systems
UEENEED119A	Design and implement Internetworking systems — advance routing
UEENEED120A	Design and implement Internetworking systems — remote access
UEENEED122A	Design and implement Internetworking systems — security
UEENEED123A	Design and implement Internetworking systems — wireless LANs/WANs

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing and implementing advance configuration of multi-layer switching in an Internetworking system between two Local Area Networks (LANs) to form a Wide Area Network (WAN) or a LAN and the Internet.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED122A Design and implement security for Internetworking systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design, implementation and performance monitoring of Internetworking systems. It encompasses safe working practice, evaluating customer requirements, applying sound design principles, complying with regulation and standards, incorporation of advance security technologies and documentation of design and performance monitoring.

Note:
This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design Internetworking systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Design brief for the advance security technologies is developed and documented based on organisation's assessment of its security vulnerabilities in consultation with person(s) of higher authority.
	1.4	Work team/group is arranged of appropriately competent persons in accordance with skills required to meet work outcomes and organisation's established procedures.
	1.5	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.6	Strategies are implemented to ensure network development is carried out efficiently.
2 Design Internetworking systems.	2.1	Internetworking system is designed to comply with design brief and consideration of economical and appropriately effective design solutions.
	2.2	Advance security technologies are included in the Internetworking system design. (See Note)

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Internetworking system design includes specification of required media that is compliant with industry standards.
	2.4	Internetworking system design is documented in accordance with organisation policies and procedures.
	2.5	Internetworking system design is presented and discussed with person(s) of higher authority.
	2.6	Alterations to the Internetworking system design resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
	2.7	Final Internetworking system design is documented and approval obtained from person(s) of higher authority.
3 Implement Internetworking systems.	3.1	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	3.2	Appropriate development tools and software are selected based on specified requirements and performance standard.
	3.3	Knowledge of Internetworking arrangements and protocols is applied to installing, configuring and testing advance routing technologies.
	3.4	System malfunctions are identified during testing and rectified using logical techniques drawing knowledge of Internetworking arrangements and protocol.
	3.5	Approaches to issues/problems are analysed to provide most effective solutions.
	3.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
	3.7	Final Internetworking system design and implementation are documented in accordance with organisation's established procedures.

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ELEMENT	PERFORMANCE CRITERIA
	Note. 1. Examples of advance security technologies are firewalls intrusion detection feature of CSACS, Cisco IOS routers, PIX for AAA service, site-to-site VPNs between Cisco devices and remote access VPNs between Cisco device and clients.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing and implementing Internetworking systems - security.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED122A Fundamentals of network security

Evidence shall show an understanding of fundamentals of network security to an extent indicated by the following aspects:

T1 Network Security fundamentals

T2 Securing Perimeter Routers

T3 Access Control Lists (ACLs)

T4 Router Authentication, Authorisation and Accounting (AAA) Security

T5 Intrusion Detection

T6 Internet Protocol (IP) Security

T7 Virtual Private Network (VPN)

T8 Firewalls

T9 Translations and Connections

T10 Access Control Lists for Firewalls

T11 AAA and Firewalls

T12 Intrusion

T13 Intrusion Detection Systems (IDS)

T14 Firewall Failover and System Maintenance

T15 Firewall VPN’s

T16 Firewall Device Management

T17 Network Security Testing

T18 Secure Network Design

T19 IPS Signatures and Signature Alarms

T20 Troubleshoot Wireless, VoIP and SAN Security

T21 Cryptographic Services

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and implement Internetworking systems – security as described in 8) and including:

A Developing a design brief for advance security technologies in an Internetworking system design brief.

B Planning work activities including requirements for work team/group.

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C	Designing Internetworking system based on economic and effective solutions that meet with design brief requirements.
D	Detailing advance security technologies and specification for Internetworking media in the design.
E	Documenting and presenting design for approval.
F	Implementing Internetworking system design.
G	Identifying and rectifying system malfunctions.
H	Documenting Internetworking installation and configuration activities.
I	Detail technologies and media specifications used in the design of advanced wireless LANs technologies.
J	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to designing and implementing Internetworking systems – security.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED119A	Design and implement Internetworking systems — advance routing
UEENEED120A	Design and implement Internetworking systems — remote access
UEENEED121A	Design and implement Internetworking systems — multi-layer switching
UEENEED123A	Design and implement Internetworking systems — wireless LANs/WANs

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing and implementing Internetworking systems - security between two Local Area Networks (LANs) to form a Wide Area Network (WAN) or a LAN and the Internet.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED123A Design and implement wireless LANs/WANs for internetworking systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers the design, implementation and performance monitoring of internetworking systems. It encompasses safe working practice, evaluating customer requirements, applying sound design principles, complying with regulation and standards, incorporation and advanced wireless LANs technologies and documentation of design and performance monitoring.

Note:
This unit applies to all aspects of Electrotechnology - engineering applications only. For general competencies related Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not

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License to practice **3)**

require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design internetworking systems.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Design brief for the advanced wireless LANs technologies is developed and documented in consultations with person(s) of higher authority.
	1.4	Work team/group is arranged of appropriately competent persons in accordance with skills required to meet work outcomes and organisation's established procedures.
	1.5	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	1.6	Strategies are implemented to ensure network development is carried out efficiently.
2 Design internetworking systems.	2.1	Internetworking system is designed to comply with design brief and consideration of economical and appropriately effective design solutions.
	2.2	Advanced wireless LANs technologies are included in the internetworking system design. (See Note 1)

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Internetworking system design includes specification of required media that is compliant with industry standards.
	2.4	Internetworking system design is documented in accordance with organisation's policies and procedures.
	2.5	Internetworking system design is presented and discussed with person(s) of higher authority.
	2.6	Alterations to the internetworking system design resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
	2.7	Final internetworking system design is documented and approval obtained from person(s) of higher authority.
3 Implement internetworking systems.	3.1	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	3.2	Appropriate development tools and software are selected based on specified requirements and performance standard.
	3.3	Knowledge of internetworking arrangements and protocols is applied to installing, configuring and testing advance wireless LANs technologies.
	3.4	System malfunctions and performance issues are identified during testing and rectified using logical techniques drawing knowledge of internetworking arrangements and protocol. (See Note 2)
	3.5	Approaches to issues/problems are analysed to provide most effective solutions.
	3.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
	3.7	Final internetworking system design and implementation are documented in accordance

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ELEMENT	PERFORMANCE CRITERIA
	organisation's established procedures.
	Note. 1. Wireless LAN technologies may include compliance with IEEE 802.11 standards, and frequency and channel usage, in-building and building-to-building WLANs and devices and appropriate antennas that meet mobility and throughput specifications, hardware set-up and software configuration of wireless products including security using WEP, WPA, and 802.1x protocols. 2. Performance issues may include using event logging, command-line utilities, and diagnostic tools

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing and implementing internetworking systems - wireless LANs/WANs.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED123A **Fundamentals of wireless security**

Evidence shall show an understanding of fundamentals of wireless security to an extent indicated by the following aspects:

T1 Wireless Standards

T2 Wireless radio technologies

T3 Wireless topologies

T4 Network Interface Cards (NICs)

T5 Access points

T6 Wireless Bridges and routers

T7 Antennas

T8 Security

T9 Application design and site survey preparation

T10 Troubleshooting, management, monitoring and diagnostics

T11 802.11 authentication and encryption methods

T12 Wireless roaming

T13 Wireless LAN network management software tools

T14 Frequency interference

T15 Emerging technologies

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. ; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and implement internetworking systems – wireless LANs and WANs as described in 8) and including:

A Developing a design brief for advance wireless LAN technologies in an internetworking system design brief.

B Planning work activities including requirements for work team/group.

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C	Designing internetworking system based on economic and effective solutions that meet with design brief requirements.
D	Detail technologies and media specifications used in the design of advanced wireless LANs technologies.
E	Documenting and presenting design for approval.
F	Implementing internetworking system design.
G	Identifying and rectifying system malfunctions.
H	Documenting internetworking installation and configuration activities.
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in context of and specific resources for assessment, evidence should show demonstrated competency in designing and implementing internetworking

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systems – wireless LANs/WANs.

Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED118A	Design and implement internetworking systems
UEENEED119A	Design and implement internetworking systems — advance routing
UEENEED120A	Design and implement internetworking systems — remote access
UEENEED121A	Design and implement internetworking systems — multi-layer switching
UEENEED122A	Design and implement internetworking systems — security

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to designing and implementing internetworking systems - wireless LANs/WANs between two Local Area Networks (LANs) to form a Wide Area Network (WAN) or a LAN and the Internet.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED124A Integrate multiple computer operating systems on a client server local area network

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers interconnecting computers to form a local area network (LAN). It encompasses applying different computer and network operating systems on a single LAN, using network standards and protocols, selecting network topology and physical media, disaster planning recovery, performance management and documentation of work activities.

Note:

This unit applies to all aspects of Electrotechnology - engineering applications only. For general competencies related Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install multiple operating systems on computers and a client server network.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Operating systems, devices, software and services required are determined from network performance specifications and in consultations with persons of higher authority.
	1.4	Network security policy is reviewed in network performance specifications and in consultation with person(s) of higher authority.
	1.5	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	1.6	Appropriate persons are consulted to ensure the work is co-ordinated effectively with others involved or affected by the work.
2 Install and configure computer and network operating systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of computer and network operations and network infrastructure are applied to installing and configuring operating systems and software on computers and client server.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Network protocols are installed and configured to integrate computers using different operating systems in compliance with industry standards and variants as specified for the network.
	2.4	Security measures of the network are implemented in compliance with security policy, industry standards and requirements specified for the network.
	2.5	Disaster recovery plan is tested for absolute effectiveness and compliance with enterprise security policy.
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Monitor and optimise computer and network performance.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Network is monitored and common methods are implemented to optimise system performance.
	3.3	Common computer and server malfunctions are identified and rectified using logical techniques and known solutions.
	3.4	Computer and server operating system incremental updates and security patches are installed as soon as they are available.
	3.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	3.6	On-going checks of the quality of work outcomes are undertaken in accordance with job specification, technical standards, enterprise policy and/or regulatory requirements.
	3.7	Work is carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
4 Report integration and outcome of network monitoring activities.	4.1	Written justification is made for solutions used to rectify malfunctions and appropriate person/s notified in accordance with established procedures.
	4.2	Computer and network installation and monitoring records are maintained in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and integrating multiple computer operating systems on a client server network.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED124A **Operating systems and networks**

Evidence shall show an understanding of fundamentals of operating systems and networks to an extent indicated by the following aspects:

T1 Operating system fundamentals

T2 Networking fundamentals

T3 Physical components of a network

T4 Transmission Control Protocol / Internet Protocol (TCP / IP) encompassing:

T5 Network Services

T6 Network Operating Systems

T7 Installation and boot processes

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. ; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Integrate multiple computer operating systems on a client server network as described in 8) and including:

A Determining the correct operating system, devices software and services required.

B Installing and configuring computer and client server operating system and software.

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C	Implementing system security measure in compliance with enterprise security policy.
D	Testing effectiveness of disaster recovery plan.
E	Using common methods to optimise system performance.
F	Identifying and rectifying common malfunctions using known solutions.
G	Providing justification for solutions used to rectify malfunctions.
H	Maintaining computer and network monitoring and records accurately.
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to integrating multiple computer operating systems on a client server network.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED112A Support computer software and hardware

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to integrating multiple computer operating systems on a client server network on at least two different operating systems for a client server and at least two computers connected to the server to form a client server network.

Note.

Examples of operating systems are various iteration of Windows, OS/2, Unix variants such as Linux and Mac OS X and the like.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Computer Systems

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UEENEED129A Develop web pages for engineering applications

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the development of web pages for engineering applications. It encompasses working safely, developing web pages using authoring tools, client-side scripting, fundamental server-side scripting and documenting development activities.

Note:
This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop web pages for engineering applications.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of development work is determined from page development specifications, including engineering subject matter, and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Appropriate development tools and software are selected based on specified requirements and performance standards.
	1.6	Strategies are implemented to ensure development work is carried out efficiently.
2 Develop web pages for engineering applications.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of syntax functions and features of mark-up languages scripts in current use are applied to developing client-side programming. (Notes 1 and 2)
	2.3	Pages are created and rendered with relative and absolute links, images and table formatting using

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ELEMENT	PERFORMANCE CRITERIA	
		cascaded styles sheets.
	2.4	Forms are created with a variety of appropriate elements and element groupings to make forms easy to follow.
	2.5	Knowledge of server scripting languages in current use is applied to scripting to developing client-side programming and validations. (See Note 3)
	2.6	Approaches to issues/problems are analysed to provide most effective solutions.
	2.7	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
3 Test, evaluate, implement and document the developed web pages.	3.1	Testing and procedures are developed to evaluate web page programming.
	3.2	Problems and bugs in web page programming are identified and rectified to ensure specifications are met.
	3.3	Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person(s).

Note

1. Examples of mark-up languages are HTML, XML and XSL.

2. Examples of scripts are JavaScript and VB script.

3. Examples of server scripting languages are JSP, ASP, PHP and Perl.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing basic web pages for engineering applications.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED129A Client side programming and server scripting

Evidence shall show an understanding of client side programming them to an extent indicated by the following aspects:

T1 Client server architecture

T2 Hyper Text Markup Language (HTML) encompassing:

- Forms
- Table
- Cascading style sheets

T3 Hyper Text Markup Language (HTML) scripting encompassing:

- Exposed object model
- Events and event handling
- Objects methods, properties, events
- Window, document, form, and form elements
- String object, methods, properties
- Form field validation

Note:

Examples of scripting language are JavaScript and Visual Basic (VB) Script

T4 Extendable Markup Language (XML) encompassing:

- Syntax
- Structure (well formed XML)
- Schemas
- Transformations
- Parsing Document Object Model (DOM) and Simple API (SAX)
- Scripting to Document Object Model (DOM)

T5 Extendible Stylesheet Language (XSL) generating HTML from XML

T6 Wireless thin client programming

Note.

Examples include Java2 Micro Edition (JEME), Mobile Information Device Profile (MIDP), Windows CE and Palm OS

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REQUIRED SKILLS AND KNOWLEDGE

T7 Consideration for system architecture

T8 Configurations and profile overview

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop basic web pages for engineering applications as

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described in 8) and including:

A	Interpreting page development requirements.
B	Identifying the appropriate development tools and software.
C	Creating and rendering effective web pages.
D	Providing basic web functionality.
E	Developing testing procedures.
F	Identifying problem and bugs in web page program.
G	Rectifying problem and bugs.
H	Writing intermediate and final work reports to the required standard.
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing basic web pages for engineering

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applications.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing basic web pages for engineering applications for any electrotechnology engineering disciplines. This shall include

- Development, implementation and testing HTML pages with at least four of the following features:
  - Relative and absolute links, images and table formatting
  - Cascaded styles sheets
  - Forms
  - New browser windows
  - Validation of form data
- Development, implementation and testing of server scripting for database access with at least four of the following features:
  - Form data input response
  - Form data processing
  - Database access
  - Output of database table contents
  - Insertion of table data to database

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED130A Select, install, configure and test multimedia components

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers assembly, setting-up and testing multimedia computer systems as directed in computer service manuals and device/driver documentation. It encompasses safe working practices, and selecting, installing, configuring and testing multimedia computer system components, applications, and driver software, following written and oral instruction and applying customer relations' procedures.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment formally-acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED102A	Assemble, set-up and test personal computer hardware
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Select and prepare to install multimedia components.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in relation to computer and keyboard use are followed.
	1.3	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.4	Multimedia components, drivers, and application software are obtained in accordance with established routines and checked as meeting requirements.
	1.5	Multimedia devices, drivers, and application software are correctly selected given user requirements and manufacturer specifications.

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ELEMENT	PERFORMANCE CRITERIA	
2 Install multimedia components.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Multimedia components are assembled and connected in accordance with manufacturer instructions.
	2.3	Multimedia devices, drivers, and application software are correctly selected given user requirements and manufacturer specifications.
	2.4	Multimedia devices are correctly installed and where not hot pluggable, computer is switched on and start-up procedures are followed and checked.
	2.5	Multimedia devices, operating system, application programs, and multimedia devices are to be checked to be opening and operating correctly.
	2.6	Multimedia devices and drivers are tested to be working correctly and benchmarked against similar devices for performance comparisons.
	2.7	Faults are identified as being the result of either faulty hardware or software.
	2.8	Faults are rectified in accordance with computer hardware, operating system and application instructions in strict accordance with OHS requirements.
	2.9	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.10	Computer shutdown procedures are followed and computer switched off.
	2.11	Work is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and report.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Work supervisor is notified of the completion of the work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and selecting, installing, configuring and testing multimedia devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED130A Multimedia computer components

Evidence shall show an understanding of computer multimedia subsystem components to an extent indicated by the following aspects:

T1 Multimedia subsystems

Note:

Examples include new multimedia standards, pixel resolution, scanning, resolution, output resolution, printer resolution, microprocessor speeds, INTEL INCOMP Index rating, cache memory speeds, system bus transfer speeds, configure a mother board, trouble shoot a mother board

T2 Multimedia storage devices

Note:

Examples include USB/flash, hard disk drive, multimedia storage devices, removable storage hard disk drive, CD-ROM/DVD drive, digital tape (DAT) drive

T3 Video cards, types and specifications

Note:

Examples include video processor, graphic processing, video RAM, bus interferences, resolution, full motion video, still image, driver software and updates

T4 Sound cards and sound card standards

Note:

Examples include MIDI interface, sound card applications, sound card connectors, FM synthesis, wave table, sound card file formats

T5 CD-ROM’s, CD-ROM/DVD standards

Note:

Examples include CD-ROM/DVD cache memory, CD-compatible, CD/DVD drive transfer speeds, CD-ROM/DVD interfaces, photo CD/DVD compatible, CD/DVD recordable, multi-session compatible.

T6 Colour printers

Note:

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REQUIRED SKILLS AND KNOWLEDGE

Examples include types of colour printers, construction and operation, dot matrix, ink-jet, laser, dye sublimation.

T7 Colour scanners

Note:

Examples include types of scanners, construction and operation, drivers and scanning software.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

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equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Select, install, configure and test multimedia devices as described in 8) and including:

A	Connecting computer, components and peripherals in accordance with requirements
B	Assembling on three separate occasions multimedia computer devices
C	Setting up on three separate occasions multimedia computer devices
D	Testing on three separate occasions multimedia computer devices
E	Documenting and reporting multimedia computer device activities and results.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to selecting, installing, configuring and testing multimedia devices.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to assembling, setting-up, and testing multimedia computer systems as directed in computer service manuals and device/driver documentation. It is to include demonstrated competence across assembly, setting-up and testing multimedia computer devices on three occasions respectively, using computer service manuals and device/driver documentation.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED143A Install and configure a client computer operating system and software

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers installing and configuring an operating system and software on a personal computer. It encompasses safe working practices, installing and testing the operating system and application software, testing functionality, rectifying operating anomalies, following written and oral instruction and procedures and applying appropriate customer relations.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to install and configure a computer operating system and software.	1.1 OHS procedures for a given work area are identified, obtained and understood.
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3 The scope of work to be undertaken is determined from documentation or from discussions with work supervisor.
	1.4 Operating system and application software versions as required for the installation are obtained in accordance with established procedures and checked against job requirements.
2 Upgrade computer and peripheral software.	2.1 OHS risk control measures and procedures for carrying out the work are followed.
	2.2 Operating system and application and network software components are installed in accordance with installation instructions and industry practices.
	2.3 Operating system, software applications and network, including device drivers, are tested in preparation for return to service/customer.
	2.4 Operating system network and software malfunctions are identified using logical techniques drawing on knowledge of operating

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ELEMENT	PERFORMANCE CRITERIA	
		system configuration requirements.
	2.5	Malfunctions are rectified using latest software versions, incremental updates and bug and security patches.
	2.6	Methods for dealing with unexpected situations are decided on the basis of safety and required work outcomes.
	2.7	Installation and configuration is carried out efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or other services.
3 Complete and report upgrading and maintenance activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Operating system network and software installation is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and configuring a computer operating system and software.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED143A Client computer operating systems and software

Evidence shall show an understanding of computer operating systems to an extent indicated by the following aspects:

T1 Basic function, components and concepts

T2 Operating systems available

T3 System installation and configuration

Note: Systems installation includes drivers, internet access and simple networking

T4 Operating system components and structure

T5 File structure and management

T6 System tools

Note: Example include control panels , wizards and the like

T7 Operating systems malfunctions and solutions

T8 Troubleshooting techniques

T9 Occupation health and safety fundamentals as they relate to computing device assemble/ disassembly and computer operating systems.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and configure a computer operating system and software as described in 8) and including:

A Obtaining appropriate operating and software versions.

B Installing and configuring operating system correctly.

C Installing and configuring software for an

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application correctly.

D Identifying and rectifying operating systems and application malfunctions.

E Documenting installation activities.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and configuring a computer operating system and software.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing and configuring operating system, including device drivers, network software and at least one software application for a client computing device.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Computer Systems

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UEENEED144A Commission industrial computer systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers undertaking commissioning procedures of industrial computer systems to comply with predetermined parameters and delivery to client. It encompasses safe working practices, system parameter testing, analysis and adjusting to assure optimum performance, following procedures, and documenting final operating parameters and settings.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a licence to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practice this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work

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License to practice **3)**

and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

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Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to commission computer systems	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	System operating parameters are identified by reviewing system specifications and component technical data.
	1.6	Tools, equipment, applications, and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.7	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
	1.8	Circuits are checked as being isolated, where necessary, in strict accordance OHS requirements and procedures.
2 Commission computer systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular system.
	2.3	Measurements and adjustments are made to computer equipment to provide optimum system performance in accordance with system specifications and/or regulatory requirements.
	2.4	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.6	Systems' commissioning procedures are performed in accordance with requirements.
	2.7	Commissioning is carried out efficiently without unnecessary waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report commissioning activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Adjustment settings are documented in accordance with established procedures.
	3.3	Work site is cleaned and made safe in accordance with established procedures.
	3.4	Commissioning results and work completion are notified to appropriate person or persons in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and commissioning computer systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED144A **Commissioning processes and procedures**

Evidence shall show an understanding of commissioning process processes and procedures to an extent indicated by the following aspects:

T1 Purpose of commissioning

T2 Commissioning planning and documentation

T3 Procedures for commissioning systems encompassing:

- configuring
- calibrating
- tuning
- validating system performance to specification
- procedures followed to commission instrument systems

T4 Purpose and importance of documentation

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. ; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Commission computer systems as described in 8) and including:

A Identifying system design performance parameters and requirements

B Measuring and adjusting system components to provide optimum system performance

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C	Ensuring system operates within regulatory and/or specification requirements
D	Documenting adjustment settings with established procedures
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to commissioning computer systems.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to commissioning two different types of computer systems and associated components and controls.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Computer Systems

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UEENEED145A Modify-redesign of industrial computer systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers the modification and redesign of industrial computer systems to augment existing systems for clients. It encompasses safe working practices, system parameter reconfiguration, analysis to assure optimum performance, following procedures, and documenting final modifications and settings.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a licence to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practice this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in

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License to practice **3)**

workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to modify-redesign of computer system(s)	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	System operating parameters are identified by reviewing system specifications and component technical data.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	The limitations, use and operation of the system to be modified is established from original specifications, manufacturers' data and the like
	1.7	The extent of modification is determined from measurements, tests, inspections, system limitations and other relevant requirements
	1.8	Specifications and instructions for the modifications are documented in accordance with requirements and organisational procedures
	1.9	Tools, equipment, applications, and devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.10	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
2 Generate modification-redesign of computer system(s)	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Alternative modification arrangements are considered and discussed with appropriate personnel
	2.3	Safety, functionality and economic considerations are incorporated in the proposed modification design
	2.4	Proposed modification complies with all requirements and includes specifications and documentation for alteration of the system(s)
	2.5	Changes in the use and operation of the system(s) as a consequence of the proposed modification are included in the documentation
	2.6	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.7	Methods for dealing with unexpected situations are selected on the basis of safety and specified

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ELEMENT		PERFORMANCE CRITERIA	
			work outcomes.
		2.8	Modification-redesign is carried out efficiently without unnecessary waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3	Completion and report modification-redesign activities.	3.1	OHS risk control work completion measures and procedures are followed.
		3.2	Proposed modification is checked under established procedures for compliance with all relevant requirements
		3.3	Work site is cleaned and made safe in accordance with established procedures.
		3.4	Proposed modification is submitted for appropriate organisational approval and, where applicable, statutory or regulatory approval
		3.5	Approved copies of the modification-redesign documents are issued, and copies retained, documented and stored in records in accordance with established procedures and requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and modifying-redesigning computer systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED145A Industrial Computer Systems Engineering Design

Evidence shall show an understanding of engineering design processes to an extent indicated by the following aspects:

T1 The functional and non-functional requirements of a customer encompassing:

- scope of the project,
- non-functional requirements

  Note:

  Examples include economics (time, cost) including total life-cycle costs - design, implementation (construction), maintenance (operation), decommissioning (recycling); aesthetics (quality)

T2 Design objectives (specifications) to satisfy a given set of customer attributes

Note:

Establishing the specifications by defining the problem and producing a solution to satisfy the customer.

T3 Creation of the design plan through solution synthesis by selecting or creating the solution

T4 Analysis

T5 Optimisation of the proposed solution

T6 Validations of the resulting design against the customer's needs

T7 Implementation of the selected design

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. ; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Modify-redesign of computer systems as described in 8) and including:

A Developing outlines of alternative redesigns.

B Developing the modified-redesigned system within the safety and functional requirements and budget limitations.

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C	Documenting and presenting modifications-redesigns effectively.
D	Successfully negotiating system alteration requests.
E	Obtaining approval for final modified-redesigned system.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to modifying-redesigning computer systems.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to modifying-redesigning computer systems across two different and representative types of computer systems and associated components, applications, and controls.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Computer systems

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UEENEED146A Set up and configure basic local area network (LAN)

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers setting up, configuring and maintaining operation of a basic local area network (LAN) of up to 20 connected devices. It encompasses safe working practices, installing network hardware, installing and configuring network software, establish user accounts, configure shared Internet connection and documenting set up parameters and LAN topology.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED102A	Assemble, set up and test computing devices
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills	**5)**
	will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set up and configure basic local area network.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent of set-up and configuration work is determined from job specifications and in consultation with appropriate person(s).
	1.3	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.4	Hardware and software needed for the work is obtained in accordance with established procedures and checked against job requirements.
	1.5	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2 Set up, configure and maintain basic local area network.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Layout of network hardware, cabling and outlets is determined from job specifications or in consultation with appropriate person(s).

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Hardware is installed in accordance with network requirements. (See Note 1)
	2.4	Network software and protocols are installed and configured in accordance with network requirements. (See Note 2)
	2.5	Network operations are tested and anomalies identified and corrected.
	2.6	Reported network failures and faults are responded to and appropriate tools and methods are used to
	2.7	Identified causes of reported problems are rectified and network is tested in accordance with established procedures.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.9	Set-up configuration and maintenance are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete work and document activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Network configuration and maintenance records are maintained in accordance with established procedures.
	3.4	Service report is completed and forwarded to appropriate person(s) in accordance with established procedures.

Notes.
1. Examples of hardware are network card, server, router, hub.
2. Examples of configuration are network protocols, user accounts and permissions, shared devices and security.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and to setting up and configuring a basic local area network.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED146A Local area network fundamentals

Evidence shall show an understanding of local area network fundamentals to an extent indicated by the following aspects:

T1 Analogue and digital signals encompassing:

- How information is carried
- Signal distortion

Note.

Examples include attenuation, reflection, noise, dispersion, jitter, latency and collisions

T2 The OSI model for computer system interconnect

- Physical Layer
- Data Link Layer
- Network Layer
- Transport Layer
- Session Layer
- Presentation Layer
- Application Layer
- Purpose of the each layer of OSI Model
- Comparing TCP and IP
- TCP and UDP
- TCP segment format
- UDP segment format
- TCP Connection Methods

T3 Types of networks, network components and hardware

T4 Local Area Network (LAN) architectures

General principle of Local Area Network (LAN) encompassing:

- benefits of a LAN.
- the elements of a LAN.
- the different types of network topology and their applications.

T5 Cabling and termination arrangements for a LAN system and define all the

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REQUIRED SKILLS AND KNOWLEDGE

hardware requirements encompassing:

- Network standards:

  Note.

  Examples are 10/100 BASE T and 10/100 BASE F.
- Applications of different types of coaxial cable, twisted pair, optical fibre cable and microwave as the transmission medium for a LAN.

T6 Multiple access units and their function

Note.

Examples are hubs, switches, access points, routers and the like

T7 LAN Standards

Note.

Examples are Ethernet (IEEE 802.3) Token Ring (IEEE 802.5) Wireless Ethernet (IEEE 802.11).

T8 Basic principle of medium access methods such as polling, token passing and CSMA/CD.

T9 Current network operating systems available for establishing a LAN encompassing:

- Network protocols
- Concepts of TCP/IP addressing
- Peer-to-peer and server based
- Establishing workgroups.
- File and device sharing

T10 Network hardware installation methods encompassing:

- Installing network card
- Installing hubs, switches and routers

T11 Concepts and the hardware required for internet and worldwide web working LANs

T12 Network software installation and configuration methods encompassing:

- Loading and configuring operating software
- Basic configuration of router operating system
- Setting up user accounts and permissions
- Establishing security

T13 Network testing and diagnostic tools and methods

T14 Networking protocols

T15 Network signal propagation

T16 Basics of Encoding Networking Signals

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REQUIRED SKILLS AND KNOWLEDGE

T17 IP addressing and subnetting

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to

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safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up and configure basic local area network as described in 8) and including:

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A	Establishing the extent of work accurately.
B	Obtaining specified hardware and software.
C	Laying out network appropriately.
D	Installing hardware as specified.
E	Installing and configuring software to requirements.
F	Identifying and correcting anomalies.
G	Diagnosing and rectifying the cause of malfunctions effectively.
H	Documenting network activities.
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up and configuring basic local area network.

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Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to setting up and configuring basic local area network that include at least:

- 2 personal computers/work stations
- 1 server
- 1 hub or switch or router
- 1 input or output device

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED147A Develop energy sector directory services

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing energy sector directory services to support centralised management and security, centralised authentication, information security and single sign on for network users, and standardised access to application data. It encompasses safe working practices, configuring directory integrated Domain Name System (DNS), installing and configuring directory services infrastructure, directory roles and services, creating and managing directory objects, maintaining the directory services environment, configuring certificate services, and documenting development activities.

Note:
This unit applies to all aspects of energy sector engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills	**5)** qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop energy sector directory services.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of directory services to be developed is determined from network performance specifications and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled time lines in consultation with others involved in the work.
	1.5	Appropriate development tools and software are selected based on specified requirements and performance standard.
	1.6	Strategies are implemented to ensure network development is carried out efficiently.

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ELEMENT	PERFORMANCE CRITERIA	
2 Install, configure and manage energy sector directory services.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge and complexities of directory services are applied to developing a directory services infrastructure.
	2.3	Structural components of directory services are installed and configured in compliance with industry standards and variants as specified for the network. (Notes 1 and 2)
	2.4	Management components of directory services are configured in compliance with industry standards and requirements specified for the network. (See Note 3)
	2.5	Security components of directory services are created using appropriate policy tools in compliance with current industry standards and requirements specified for the network.
	2.6	Directory service malfunctions are identified and rectified using logical techniques and drawing knowledge of complex network infrastructure.
	2.7	Directory services are monitored and solutions are developed to optimise network performance and reliability in accordance with established procedures.
	2.8	Security events are analysed and actions taken in accordance with established policy.
	2.9	Approaches to issues/problems are analysed to provide most effective solutions.
	2.10	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

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ELEMENT	PERFORMANCE CRITERIA
3 Report network administration activities	3.1 Written justification is produced for directory services development activities and appropriate person/s notified in accordance with established procedures. 3.2 Network service development records are maintained in accordance with established procedures. Notes. 1. Examples of structural components may include domains, domain controllers, sites, subnets, site links, connection objects, Organisational units and DNS. 2. Examples of configuring may include site memberships global catalogue designation, zones for dynamic and secure dynamic updates and creation and configuration of DNS records. 3. Management components may include Management consoles, Active Directory Users and Computers, Domains and Trusts, Sites and Services

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing energy sector network services.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED147A Energy sector directory services

Evidence shall show an understanding of directory services to an extent indicated by the following aspects:

T1 Configuring directory service integrated Domain Name System (DNS)

- Configuring zones
- Configuring DNS server settings
- Configuring zone transfers and replication

T2 Configuring the directory services infrastructure

- Configuring logical directory topologies
- Configuring trust relationships
- Configuring physical site topology infrastructure
- Configuring directory replication
- Configuring directory services master roles

T3 Configuring directory service roles and services

- Configuring authentication servers
- Configuring command line server installations
- Configuring rights management
- Configure domain controllers
- Configure trust policies

T4 Creating and maintaining directory service objects

- Creating and maintaining accounts
- Create and apply policy objects
- Configure policy templates
- Deploy and manage software using policies
- Configure account policies

T5 Maintaining the directory services environment

- Configure backup and recovery for directory services
- Perform off-line maintenance
- Monitor the directory service

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REQUIRED SKILLS AND KNOWLEDGE

T6 Configure certificate services

- Install certificate services
- Configure the certification authority (CA) server settings
- Manage certificate templates
- Manage certificate enrolments
- Manage certificate revocations

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

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equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgement.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the time frames typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop energy sector directory services as described in 8) and including:

A	Configuring directory integrated name resolution.
B	Installing and configuring a directory services infrastructure.
C	Configuring directory services roles and services.
D	Creating and maintaining directory services objects.
E	Maintaining the directory environment
F	Configuring certificate services
G	Documenting directory services development activities.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor certification may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing energy sector directory services.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation developing and managing energy sector directory services for a network that is to provide centralised management and security, centralised authentication, information security and single sign on for network users, and standardised access to application data.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED148A Plan industrial computer systems projects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers development and documentation of industrial computer systems project proposals, milestones and completions .The unit encompasses, establishing budgets, critical path analysis, development of workflow strategies, documenting, presenting and negotiating budgets and timelines.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to plan project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
		1.2	Established techniques for project planning are reviewed are adopted in accordance with organisation policies.
		1.3	The extent of the project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
2	Develop project plan proposal.	2.1	Estimated plant, material, labour and other costs are sought and obtained from appropriate person(s) in accordance with organisation policies and procedures.
		2.2	Project budget is established from estimated plant, material, labour and other costs in accordance with organisation policies and procedures.
		2.3	Knowledge of critical path analysis is applied to developing workflow strategies.
		2.4	Sources and availability of materials and human resources needed for the project are established in accordance with organisation policies and procedures.
		2.5	Risk management strategies are sought and obtained for incorporating into the project plan.
		2.6	Project plan is reviewed against all inputs and adjusted to rectify any anomalies.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Project plan proposal is documented in accordance with organisation policies and procedures.
3 Obtain approval for project plan.	3.1	Project plan is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the project plan resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
	3.3	Final project plan is documented and approval obtained from appropriate person(s).

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning computer systems projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED148A Industrial Computer Systems Project Planning

Evidence shall show an understanding of project planning to an extent indicated by the following aspects:

T1 Purpose of project planning

T2 Documents needed to plan a project

T3 Factors influencing sequence and restraints of project activities

T4 Critical path analysis encompassing:

- Graphical representation methods
- Methods of representing time/rates

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan computer systems projects as described in 8) and including:

A Determining the project requirements accurately.

B Establishing a project budget.

C Developing effective work flow strategies.

D Documenting project plan proposal.

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E	Negotiating alterations to the proposed project plan successfully.
F	Obtaining approval of the final plan.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to planning computer systems projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to a planning of a computer system project that is representative, with not less than the following features:

- Security
- Redundancy
- Scalability
- 100 users
- Catering multiple operating systems

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Computer Systems

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UEENEED149A Develop energy sector computer network applications infrastructure

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers developing an applications infrastructure for energy sector enterprise computer networks. It encompasses safe working practices, deploying servers, configuring remote desktop services, configuring a web services infrastructure, configuring network application servers, documenting development activities.

Note:

This unit applies to all aspects of energy sector engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 6 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop a network applications infrastructure.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of network application infrastructure to be developed is determined from network performance specifications and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled time lines in consultation with others involved in the work.
	1.5	Appropriate development tools and software are selected based on specified requirements and performance standard.
	1.6	Strategies are implemented to ensure network development is carried out efficiently.
2 Install, configure and manage applications infrastructure components.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge and complexities of network applications infrastructure are applied to developing the network.
	2.3	Network applications infrastructure components in current use and installed and configured in compliance with industry standards and variants

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ELEMENT	PERFORMANCE CRITERIA	
		as specified for the network. (See Note 1)
	2.4	Management components of the network applications infrastructure are configured in compliance with current industry practices and requirements specified for the network.
	2.5	Security components of network the network applications infrastructure are created in compliance with current industry practices and requirements specified for the network. (See Note 2)
	2.6	Network malfunctions are identified and rectified using logical techniques and drawing knowledge of complex network infrastructure.
	2.7	Network is monitored and solutions are developed to optimise network performance and reliability in accordance with established procedures.
	2.8	Security events are analysed and actions taken in accordance with established policy.
	2.9	Approaches to issues/problems are analysed to provide most effective solutions.
	2.10	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
3 Report network administration activities	3.1	Written justification is produced for network services development activities and appropriate person/s notified in accordance with established procedures.
	3.2	Network applications infrastructure development records are maintained in accordance with established procedures.

Notes.
1. Examples of network applications infrastructure components may include Windows Deployment services, KMS servers, virtualisation, remote access services, Internet Information Server (IIS), streaming media services, Microsoft Share Point.

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ELEMENT	PERFORMANCE CRITERIA
	2. Examples of security components may include KMS servers, certificate configurations, authorisation policies, Group Policy, SSL security.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing energy sector network services.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED149A Energy sector computer network applications infrastructure

Evidence shall show an understanding of network applications infrastructure to an extent indicated by the following aspects:

T1 Deploying network servers:

- Install from media
- Use automated installation services
- Deploy servers using imaging
- Dynamic driver provisioning
- Operating system activation
- Configuring virtual servers
- Failover clustering and load balancing
- Storage technologies

T2 Remote desktop services

- Provide access to remote resources
- Configure remote application access
- Provide authorisation and single sign on (SSO)
- Remote desktop authorisation policies
- Monitor remote desktop resources
- Configure allocation of resources using resource management tools
- Configure remote desktop licensing

T3 Configure a web services infrastructure

- Configure web applications
- Manage web sites
- Manage virtual directories
- Configure web applications
- Configure FTP services
- Configure SMTP services
- Create service accounts
- Manage web server technologies
- Configure backup and restore options

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REQUIRED SKILLS AND KNOWLEDGE

- Configure certificate security
- Configure web authentication and permissions

T4 Configure network application services

- Manage streaming media services
- Configure on demand replication
- Configure multicast streaming
- Secure streaming media
- Provide encryption methodologies
- Configure rights management
- Configure content management systems (CMS)
- Configure a document library
- Configure network applications

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

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various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgement.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the time frames typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be

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required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop energy sector network services as described in 8) and including:

A	Establishing network applications infrastructure to be developed.
B	Configuring management components of the network applications infrastructure.
C	Configuring security components of the network applications infrastructure.
D	Identifying and rectifying network malfunctions.
E	Developing solutions to optimise network performance.
F	Documenting network applications infrastructure development activities.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor certification may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice

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using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing a energy sector network applications infrastructure.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation developing and managing an applications infrastructure for energy sector enterprise computer networks to provide network clients with access to such services as web services, FTP services, virtualisation, remote access services and applications services.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Computer Systems

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UEENEED150A Develop industrial control programs for microcomputer equipped devices

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers development of hardware and programs to control external devices using microcomputers as apply to engineering product development work. It encompasses working safely, following design brief, applying knowledge of microcomputer architecture, constructing prototype devices, programming using assembler or 'C' programming language, testing device operation and documenting development work.

Note:
This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not

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License to practice **3)**

require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop control programs for microcomputer equipped devices.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of development work is determined from design brief and in consultation with relevant persons.
	1.4	Development work is planned to meet scheduled timelines in consultation with others involved on the work site.
	1.5	Appropriate development tools and software are selected based on specified requirements and performance standards.
	1.6	Materials and devices/components required for the work are selected on compatibility of specifications with control requirements and project budget constraints.
	1.7	Strategies are implemented to ensure development work is carried out efficiently.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop control programs.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of computer-equipped devices and systems and compliance standards are applied to the design.
	2.3	Alternative arrangements for the development are considered based on the requirements outlined in the design brief.
	2.4	Safety, functional and budget considerations are incorporated in the design.
	2.5	Prototype devices and circuits are constructed and tested for compliance with the design brief and regulatory requirements.
	2.6	Knowledge of programming language code, functions and features in current use are applied to developing control programs.
	2.7	Prototype malfunctions are rectified and re-tested to ensure effective operation of design.
	2.8	Program development is documented for submission to appropriate person(s) for approval
	2.9	Approaches to issues/problems are analysed to provide most effective solutions.
	2.10	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
3 Test, evaluate, implement and document control programs.	3.1	Testing and procedures are developed to evaluate control program.
	3.2	Problems and bugs in program are identified and rectified to ensure specifications are met.
	3.3	Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing control programs for microcomputer equipped devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED150A Microprocessor/microcontroller assembler language programming

Evidence shall show an understanding of microcontroller control system programming methods, microprocessor assembly language, high-level language programming as it is applied to engineering applications to an extent indicated by the following aspects:

T1 Programming terms

T2 Language levels and their features

T3 Language simulators and emulators

T4 Language programming basics encompassing:

- Programming input/output functions
- Timing loops

T5 CPU Architecture

- registers.
- instruction set considerations, common and advanced instructions.
- addressing modes supported: direct, indirect, indexed etc.
- software interrupts and system calls.

T6 Processor And System Support

- instruction pre-fetch pipeline.
- system timer chip, function and programming.
- hardware interrupts programming considerations.
- DMA devices and support.
- co-processors and bus interface.

T7 Modular Programming

- separately compiled and linked assembly language modules.
- library modules.
- macros.

T8 Documentation And Debugging

- system specification and documentation
- debugging and tracing program execution

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REQUIRED SKILLS AND KNOWLEDGE

T9 Complex data types and structures encompassing:

- Pointers/references
- arrays and strings
- user-defined data types

T10 Interfacing high-level languages to assembler encompassing:

- in-line assembly.
- bit manipulation
- IO port addressing

T11 Interrupt Service Routines

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

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access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop control programs for microcomputer equipped devices as described in 8) and including:

A	Determining the extent of development work requirements.
B	Identifying the appropriate development tools and software.
C	Selecting devices/components compatibility with control requirements and project budget constraints.
D	Developing control program within the safety and functional requirements and budget limitations.
E	Documenting and presenting program development effectively.
F	Successfully negotiating program alteration requests.
G	Obtaining approval for final program developed.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

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These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing control programs for microcomputer equipped devices.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing control programs for microcomputer equipped devices with at least five interacting functions and using a programming language currently used in industry.

Note.

Although ‘C’ and assembler languages are preferred, other relevant language in current industry use may be used.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED151A Provide programming solution for computer systems engineering problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing, implementing and testing programming solutions, using a structured programming language. It encompasses following design brief using appropriate development software, writing code and documenting development activities.

Note 1:
Typical engineering problems are those encountered in meeting requirements in a design brief, meeting performance requirements and compliance standards, revising a systems operating parameters and dealing with system malfunctions.

Note 2:
This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills	**5)** qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop programming solution.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of engineering problem is determined from performance specifications and situation reports and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
	1.5	Appropriate development kit and software tools are selected based on specified requirements and performance standard.
	1.6	Strategies are implemented to ensure programming is carried out efficiently.
2 Develop programming solutions.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of programming functions and

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ELEMENT	PERFORMANCE CRITERIA	
		features are applied to providing a programming solution.
	2.3	Code in existing programs is analysed and modifications or corrections made to rectify program performance.
	2.4	Key features of the programming language are applied to develop and test solutions. (Note)
	2.5	Approaches to issues/problems are analysed to provide most effective solutions.
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
3 Test and document the programming solutions.	3.1	Testing procedures are developed to analyse code developed in relevant programming language.
	3.2	Problems and bugs in program are rectified to ensure compliance with program performance requirements.
	3.3	Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person(s).

Note:
1. Key features include that features classes, inheritance, polymorphism, arrays and packages.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and provide programming solution for engineering problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED151A High level programming for engineering applications

Evidence shall show an understanding of control programming fundamentals and high-level language programming as it is applied to engineering applications to an extent indicated by the following aspects:

T1 Control applications of software

T2 Software terminology

T3 Programming languages currently used by industry

T4 Program development

Note:

Examples may include flowcharts, pseudocode, algorithms

T5 Programming concepts encompassing:

- programming structure
- documentation
- compiling source code
- generating executable files
- scalar and structured data types
- constants and variables
- reading from keyboard and writing to screen
- arithmetic, relational and logical operations
- making decisions
- looping operations
- programming to access external devices via I/O boards
- functions

  Note:

  Examples may include macros; global and local variables, auto and static variables; Intrinsic functions used in control; Writing functions; Linking in external functions to control hardware
- numerical and character arrays

T6 Complex data types and structures encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Pointers/references
- arrays and strings
- user-defined data types

T7 Interfacing high-level languages to assembler encompassing:

- in-line assembly.
- bit manipulation
- IO port addressing

T8 Interrupt Service Routines

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

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- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide programming solution for engineering problems as described in 8) and including:

A	Understanding the engineering programming problem.
B	Using all key features of programming language.
C	Developing testing procedures.
D	Identifying problems and bugs in code.
E	Rectifying problems and bugs in code.
F	Writing intermediate and final documents in accordance with professional standards.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

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These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing programming solution for engineering problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to providing programming solution for engineering problems in any high level programming language used in engineering applications.

Note:

Example of programming languages are ‘C’, and object oriented languages such as ‘C++’, Java and Visual Basic.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED152A Design embedded controller control systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers designing control systems using microcontrollers, or PCs or embedded signal processors (DSPs). It encompasses working safely, following design briefs and applying knowledge of embedded system devices, interpreting device specifications, constructing prototypes, using appropriate development software, applying programming techniques, testing developed system prototype operation, verifying compliance of the design against the final brief and documenting design and development work.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills **5)**

qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design and develop advance embedded systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the proposed embedded system development is determined from the design brief or in consultation with appropriate person(s).
	1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
	1.5	Materials and devices/components required for the work are selected on compatibility of their specifications with embedded system requirements and project budget constraints.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Design and develop advance embedded systems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	Knowledge of embedded devices and systems and compliance standards are applied to the design.
	2.3	Alternative arrangements for the design are considered based on the requirements outlined in the design brief.
	2.4	Safety, functional and budget considerations are incorporated in the design.
	2.5	Prototype devices and circuits are constructed and tested for compliance with the design brief and regulatory requirements.
	2.6	Prototype malfunctions are rectified and retested to ensure effective operation of design.
	2.7	Embedded system design is documented for submission to appropriate person(s) for approval.
	2.8	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for embedded systems design.	3.1	Embedded system design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for design modifications are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.
	Note. Prototype construction includes programming some devices.	

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing embedded controller systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED152A Embedded microcontroller programming

Evidence shall show an understanding of microprocessor assembly language and high-level language programming as it is applied to engineering applications to an extent indicated by the following aspects:

T1 CPU Architecture

- registers.
- instruction set considerations, common and advanced instructions.
- addressing modes supported: direct, indirect, indexed etc.
- software interrupts and system calls.

T2 Processor And System Support

- instruction pre-fetch pipeline.
- system timer chip, function and programming.
- hardware interrupts programming considerations.
- DMA devices and support.
- co-processors and bus interface.

T3 Modular Programming

- separately compiled and linked assembly language modules.
- library modules.
- macros.

T4 Documentation And Debugging

- system specification and documentation
- debugging and tracing program execution

T5 Complex data types and structures encompassing:

- Pointers/references
- arrays and strings
- user-defined data types

T6 Interfacing high-level languages to assembler encompassing:

- in-line assembly.
- bit manipulation

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REQUIRED SKILLS AND KNOWLEDGE

- IO port addressing

T7 Interrupt Service Routines

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design embedded controller systems as described in 8) and

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including:

A	Developing outlines of alternative designs.
B	Developing the design within the safety and functional requirements and budget limitations.
C	Constructing and testing prototype devices and circuits according to design brief and regulatory requirements.
D	Documenting and presenting design effectively.
E	Successfully negotiating design alteration requests.
F	Obtaining approval for final design.
G	Verifying compliance of the design against the final brief.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

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Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing embedded controller systems

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Nil

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing and developing an embedded system, which controls at least three I/O devices or functions.

Note:

Examples include: keyboard and/or LCD interfacing, driving motors, reading, logging and analysing sensor devices.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Computer Systems

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UEENEED153A Set up, configure and test biometric devices

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers setting up and testing various biometric devices as implemented in the field of biometric measurements. This is achieved through the installing, setting up, configuring and testing biometric devices in accordance with requirements. It encompasses safe working practices, following written and oral instructions and procedures, applying knowledge of biometric devices then installing and testing their performance while documenting outcomes.

Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED102A	Assemble, set up and test computing devices
UEENEED146A	Set up and configure basic local area network (LAN)
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to set up and test biometrics devices	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of device set up and configuration work is determined from job specifications and in consultation with appropriate person(s).
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
		1.5	Hardware, software and materials needed for the work are obtained in accordance with established procedures and checked against job requirements.
		1.6	Tools and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Set up and test biometric devices	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Circuits/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.3	Layout of biometric system network hardware, cabling and outlets is determined from job specifications or in consultation with appropriate

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ELEMENT	PERFORMANCE CRITERIA	
		person(s)
	2.4	Hardware is set up in accordance with network requirements (See Note 1)
	2.5	Biometric devices are set up and configured in accordance with network requirements.
	2.6	Biometric devices on a network are tested and anomalies identified and corrected.
	2.7	Biometric device failures are responded to and rectified in accordance with requirements.
	2.8	Essential knowledge and associated skills required to set up and test biometric devices are applied to ensure work is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.9	Identified causes of reported problems are rectified and biometric devices are tested in accordance with established procedures.
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.11	Biometric device installation and set-up are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete set up, test and report.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Biometric device installation and maintenance records are maintained in accordance with established procedures.
	3.4	Service report is completed and forwarded to appropriate person(s) in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA
	Note 1: Connection of equipment may include both plug connected power supply and network

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up and testing biometric devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED153A Biometric devices

Evidence shall show an understanding of biometric devices to an extent indicated by the following aspects:

T1 Biometrics techniques and processes including definitions, terminology, advantages, disadvantages and applications

Note.

Includes basic principles of database design, software techniques, classifier combination, feature extraction, feature enhancement, chain code methods, image analysis, biometric transforms, matching techniques, verification and identification, biometric tools, satistical measures of biometrics

T2 Biometric device tools, software and testing techniques

T3 Physical interaction with biometric devices including operation and installation of biometric devices examples are iris scanners, hand scanners voice recognition apparatus, facial recognition devices and like equipment

T4 Legal aspects of biometrics

- Australian laws impacting on biometrics security and privacy legislation.
- Australian standards

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up and test biometric devices as described in 8) and including:

A Placing equipment in accordance with regulatory and customer requirements.

B Applying knowledge of relevant legislation, standards and/or codes of practice pertaining to security and privacy associated with biometric devices

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C	Selecting appropriate equipment.
D	Entering functions and parameters in accordance with requirements.
E	Testing and verifying functional operation of device(s).
F	Responding to system anomalies to effect functionality of device(s) according to requirements.
G	Completing necessary documentation including handing over equipment maintenance and operating instructions documents to the customer.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the

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approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up and testing biometric devices.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to setting up and testing four different types of biometric device.

Note.

Examples of biometric devices are iris recognition scanners, palm print scanners, signature readers, voice recognition devices, data capture devices.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEED154A Analyse and implement biometric measuring techniques and applications

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers analysing and implementing the various established biometric techniques and applications as implemented in the field of biometric measurements. This is achieved through evaluation of the major biometric system from enrolment phase, interaction with the operator and subject, to decision making. It encompasses safe working practices, following written and oral instructions and procedures, applying knowledge of biometric systems then implementing, testing and evaluating their performance while documenting outcomes.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED102A	Assemble, set up and test computing devices
UEENEED146A	Set up and configure basic local area network (LAN)
UEENEED153A	Set up and test biometric devices
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of

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Employability Skills	**5)** competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to analyse and implement biometric techniques and applications.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Consideration is given to technical factors that will have an impact on the design and system rollout in criminal, civil and commercial settings.
	1.4	Technical and physical requirements of a biometric system required for efficient implementation and system rollout are identified
	1.5	Existing and planned technical and environmental goals of the enterprise are evaluated and documented.
	1.6	Work team/group is arranged of appropriately competent persons in accordance with skills required to meet work outcomes and

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ELEMENT	PERFORMANCE CRITERIA	
		organisation's established procedures.
	1.7	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.8	Correct operation and safety of software, tools, equipment, and testing devices needed to carry out the work are obtained and checked in accord requirements.
	1.9	Work supervisor or customers are consulted to determine which functions of the system are to be used and the parameters of each and seek written confirmation.
2 Analyse and implement biometric techniques and applications	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of technology and the processes of implementation used with biometric systems are applied in analysing and implementing biometric techniques and applications according to requirements.
	2.3	Performance of landline versus mobile telephony in association with biometric systems is analysed. Note: Analysis and evaluation to incorporate development process, target enrolment, identification and verification, system installation requirements, software, equipment requirements and instructions for the biometric system.
	2.4	Safety, functional and budgetary considerations are incorporated in the installation design plan analysis and evaluation.
	2.5	Hardware and software required for the biometric system are analysed and implemented in accordance with the developed plan and established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Australian and International standards and/or codes of practice are used to evaluate compliance.
	2.7	Practical aspects and limitations of biometric system implementation are demonstrated through the use of multi-biometrics.
	2.8	Location of each device in the installation of the biometric system to ensure correct operation of system functions is documented.
	2.9	Solutions to unplanned situation are provided that are consistent with legal requirements and established procedures.
3 Report on biometric system analysis and implementation	3.1	Hardware and software required for the biometric system are analysed for compliance requirements and in accordance with OHS requirements and established procedures
	3.2	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	3.3	Possible system malfunctions are identified during system analysis and implementation using logical techniques drawing on knowledge of biometric systems.
	3.4	Approaches to issues/problems are analysed to provide most effective solutions.
	3.5	Work completion is documented and notified appropriate person(s) or persons in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and analysing and implementing biometric techniques and applications for in field use.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED154A Biometric Equipment/Systems Techniques and Applications

Evidence shall show an understanding of automatic data capture and biometric systems techniques and applications to an extent indicated by the following aspects:

T1 Forms of automatic data capture, advantages and disadvantages

T2 Selection of barcodes from standards

T3 Suitability of automatic data capture equipment including readers, printers, ancillary devices and radio frequency for various applications

T4 Interfacing issues between systems involving different hardware and software

T5 Functional design and construction of a simple system

T6 Complex biometric systems technology applications used in forensics, genetics, civil and commercial environments,, government departments and defence for verification of identities, encompassing:

- Voice Recognition
- Speech Recognition
- Handwriting Analysis
- Signature Verification
- DNA Technology
- Multi-biometrics

Note.

Examples of biometrics system technologies used including voice recognition interfacing components and hardware, speech extraction and evaluate speech recognition system performance, handwriting digitizers tablets, hardware and software used in signature verification, DNA technology in biometric systems,

T7 Technical principles, parameters, and processes underpinning each biometric system technology in identity and verification recognition

T8 Typical selection, evaluation and testing criterion and methods of biometrics systems, encompassing:

- comparative features of selection, evaluation and testing methods of various biometrics systems
- vendor claims, product suitability and product specifications

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment

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instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse and implement biometric techniques and applications as described in 8) and including:

A Evaluating fingerprint matching, palm print analysis, hand geometry investigation, facial verification, iris recognition, retinal scan, voice recognition, speaker verification, handwriting

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	analysis, signature verification, DNA technology techniques and applications for in field of biometric use
B	Implementing advice of fingerprint matching, palm print analysis, hand geometry investigation, facial verification, iris recognition, retinal scan, voice recognition, speaker verification, handwriting analysis, signature verification, DNA technology techniques and applications for in field of biometric use
C	Any two of the following features: • analysis and evaluation development process • target enrolment • identification and verification • system installation requirements • software requirements • equipment requirements and instructions
D	Applying knowledge of relevant legislation, standards and/or codes of practice pertaining to security and privacy associated with biometric system techniques and applications
E	Documenting and recording results in accordance with requirements
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to analysing and implementing a biometric system for in field use.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED15 3A Set up and test biometric devices

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to analysing and implementing a biometric system, including at least two of the following features:

- analysis and evaluation development process
- target enrolment
- identification and verification
- system installation requirements
- software
- equipment requirements and instructions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Computer Systems

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UEENEED155A Develop and validate biometric equipment/systems installation

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the development of biometric equipment/system installation, instructions and validating requirements of biometric systems. It encompasses working safely, understanding operating parameters and capabilities, following instructions and while documenting outcomes.

Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED102A	Assemble, set up and test computing devices
UEENEED146A	Set up and configure basic local area network (LAN)
UEENEED153A	Set up and test biometric devices
UEENEED154A	Analyse and implement biometric techniques and applications
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills **5)**

will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop and validate biometric equipment/systems installation and related instructions and validation	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Consideration is given to technical factors that will have an impact on the system installation in criminal, civil, and commercial settings.
	1.4	The extent of the biometric database is identified and evaluated, including factors affecting the integration and application of proprietary or open source packages.
	1.5	Evaluate for documenting the existing and planned technical and environmental requirements, including the enterprise.
	1.6	Work team/group is arranged of appropriately competent persons in accordance with skills required to meet work outcomes and organisation's established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.7	The business requirements of the enterprise taking into account, existing and projected business model, organisational and information technology management structures and legal aspects of biometrics in Australia and overseas environments are analysed.
	1.8	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.9	Correct operation and safety of software, tools, equipment and testing devices needed to carry out the work are obtained and checked in accord requirements.
	1.10	Work supervisor or customers are consulted to determine which functions of the system are to be used and the parameters of each, and written confirmation sought.
2 Develop and validate biometric equipment/systems installation and related instructions and validation	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of technology of biometric systems, information technology, network security and other services, installation performance standards, compliance methods and service equipment when developing the biometric system are applied in accordance with requirements.
	2.3	Development process for installation, equipment, instructions, and validation requirements of the biometric system are evaluated.
	2.4	Safety, functional and budgetary considerations are incorporated in the installation plan analysis and evaluation.
	2.5	Equipment required for the biometric system are validated in accordance with the developed plan and established procedures.
	2.6	Australian and International standards and/or codes of practice are used to evaluate compliance.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Required status and parameters of each function of system devices are entered and set in accordance established procedures, manufacturers instructions and customer's requirements.
	2.8	Location of each device in the installation of the biometric system to ensure correct operation of system functions is documented.
	2.9	Solutions to unplanned situation are provided that are consistent with legal requirements and established procedures.
3 Validate and report on biometric equipment/systems installation and related instructions and validation	3.1	The biometric system is tested for compliance requirements and in accordance with OHS requirements, requirements and established procedures
	3.2	Operating anomalies are identified and reported in accordance with established routines.
	3.3	Possible system malfunctions are identified during compliance testing using logical techniques drawing on knowledge of biometric systems.
	3.4	Approaches to solving issues/problems are analysed to provide most effective solutions.
	3.5	Work completion is documented and notified appropriate person(s) or persons in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing biometric system installation, instructions and validating requirements of biometric systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ED155A Biometrics and Security

Evidence shall show an understanding of biometrics equipment techniques and applications and biometric and security to an extent indicated by the following aspects:

T1 Technology applications used in forensics, genetics, civil and commercial environments and government departments for verification of identities, encompassing:

- Fingerprint matching
- Palm Print
- Hand Geometry
- Face Verification
- Iris Recognition
- Retina Scan

Note.

Examples of biometrics equipment technology used including scanning and digitizing of samples, enhancement of captured data, feature extraction, classification, matching, searching and manual verification

T2 Technical principles, parameters, and processes underpinning each of the above technologies in identity recognition

T3 Typical selection, evaluation and testing criterion and methods of biometrics equipment, encompassing:

- comparative features of selection, evaluation and testing methods of various classes of equipment
- vendor claims, product suitability and product specifications

T4 Compliance requirements for implementing security on personal computers and computer networks

T5 Compliance requirements for securing voice over the internet

T6 Compliance requirements for assuring IT network security and capital planning measures encompassing:

- security risks versus investment risks,

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REQUIRED SKILLS AND KNOWLEDGE

- investment management life cycle
- capital management and investment control
- alternatives and budget analyses of IT security

T7 Security implementation encompassing:

- biometrics in law and relationship with legislation
- trusted networks, cryptography and data security characteristics
- advanced authentication, digital certificates and digital signatures
- cost comparison and evaluative analysis

T8 Laws, standards and compliance guidelines encompassing:

- international
- national
- local
- codes
- institutional

T9 Preparing and selecting a vendor encompassing:

- client needs analysis
- project parameters according to business needs analysis
- project goals and criteria
- tender process management
- project monitoring and evaluation

T10 Deployment principles for rollout of Biometrics system(s) encompassing:

- scalability and manageability
- trailing and testing
- commissioning
- compliance documentation

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop and validate biometric equipment/systems installation as described in 8) and including:

A Evaluating operating functions and parameters

B Selecting appropriate equipment.

C Any two of the following features:

- securing computer networks

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- data base design
- measurement of a biometric system
- equipment requirements and instructions

D	Entering functions and parameters correctly.
E	Testing and verify system operation.
F	Correcting system anomalies effectively.
G	Applying knowledge of relevant legislation, standards and/or codes of practice pertaining to security and privacy associated with biometric system techniques and applications
H	Documenting and recording results in accordance with requirements
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing and validating biometric equipment/systems installation.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing biometric system installation, instructions and validating requirements of biometric equipment/systems., including at least two of the following features:

- securing computer networks
- data base design
- measurement of a biometric system
- equipment requirements and instructions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Competency Field

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UEENEEE006B Apply methods to maintain currency of industry developments

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers methods for keeping up-to-date with developments in electrotechnology-adopted technologies, standards and safety that affect the currency of competencies held. It encompasses accessing relevant information and skills and using formal and informal ways of acquiring this information and skills.

Application of the Unit

Application of the Unit

2)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice

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Application of the Unit **2)**

(1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license in the relevant discipline to practice in the workplace. Also, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to apply methods to maintain currency of industry developments	1.1	Areas of work activity that may be affected by outdated methods and knowledge are identified.
	1.2	Information and advice is sought on the effects of current legislated requirements on work outcomes.
	1.3	Sources of information related to technical and regulatory developments are investigated.
2 Apply methods to maintain currency of industry developments	2.1	Methods are used to ensure that the application of OHS policies complies with current regulations, codes and practices.
	2.2	Methods are used to ensure technical aspects of work undertaken are aligned to current practices and comply with current regulations.
	2.3	Methods are used to ensure managerial aspects of work undertaken are aligned to current practices and comply with current regulations.
	2.4	Formally recognised methods for maintaining currency of industry developments are identified and applied.
	2.5	Maintenance of current knowledge and practices for the work undertaken is documented in accordance with formally recognised processes.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and applying methods to maintain currency of industry developments.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE006B Requirements and methods for maintaining currency in industry developments

Evidence shall show an understanding of requirements and methods for maintaining currency in industry developments to an extent indicated by the following aspects:

- Requirements to maintain currency in industry practices and products encompassing:
  - Regulatory
  - Industry
  - Professional/Association
  - Other
- Sources of information in industry changes and new developments encompassing:
  - Legislation and regulation
  - Technical Standards
  - Codes and industry/work practices and processes
  - Manufacture's product catalogues and instruction manuals
  - Industry Journals
  - Safety and environmental issues
- Currency of technology, machinery, equipment and tools applications and uses
- Acceptable methods of formally maintaining currency

  Note.

  1. Examples are formal industry refresher programs, industry seminars, product promotion programs and the like.

  2. Acceptable methods may vary in different jurisdictions

Evidence Guide

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required

9.2)

Before the critical aspects of evidence are considered all

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EVIDENCE GUIDE

to demonstrate competency in this unit

prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Apply methods to maintain currency of industry developments in 8) and including:

    A Identifying areas of work affected by outdated methods and knowledge.

    B Using methods to ensure current OHS practices are applied.

    C Using methods to ensure technical aspects of work are aligned to current practices and comply with current regulations.

    D Using methods to ensure managerial aspects of work undertaken are aligned to current practices

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and comply with current regulations.

E Applying formally recognised methods to maintain currency of industry developments.

F Documenting maintenance of current knowledge and practices for the work undertaken appropriately.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to applying methods to maintain currency of industry developments.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE018B	Establish, maintain and evaluate OHS systems

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to applying methods to maintain currency of industry developments in any electrotechnology discipline in which work is undertaken.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE009B Comply with scheduled and preventative maintenance program processes

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the quality assurance and risk management compliance processes for maintenance of the electrotechnology aspects of plant and equipment. It encompasses working safely and to technical, quality and risk management standards, work specifications and maintenance schedules, sample inspections, evaluating components and completing the necessary maintenance documentation.

Application of the Unit

Application of the Unit

2)

This unit apply to any qualification in this standard at an AQF 3 level.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Where refrigeration and air conditioning are involved practice in the workplace is subject to Federal/State/Territory regulations covering the use of refrigerants and the relevant codes of practice; in some

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jurisdictions a licence is required.

Practice in the workplace is also subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills	**5)**
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to comply with scheduled maintenance program processes.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards which have not previously identified are noted and established risk control measures are implemented.
	1.4	The maintenance schedule and process compliance requirements are confirmed and work appropriately sequenced in accordance with established procedures.
	1.5	Appropriate person(s) are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Location equipment to be maintained is

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ELEMENT		PERFORMANCE CRITERIA	
			determined from maintenance schedule procedures and/or system specifications and diagrams.
		1.7	Resources needed to conduct the maintenance is obtained in accordance with established procedures and checked against job requirements.
		1.8	Tools, equipment and testing devices needed to conduct the maintenance are obtained in accordance with established procedures and checked for correct operation and safety.
2	Comply with scheduled maintenance program processes.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Test or measure on a live and operating system in strict accordance with OHS requirements and within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Apparatus to be maintained is inspected and evaluated for compliance with requirements in accordance with maintenance schedule.
		2.5	Non-compliant apparatus/components are documented and arrangements made for their rectification in accordance with established procedures.
		2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.7	Ongoing checks of the quality of the maintenance are undertaken in accordance with established procedures.
		2.8	Maintenance process compliance is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion of maintenance compliance processes.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site and equipment is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to verify that the maintenance complies with requirements.
	3.4	Maintenance completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and complying with scheduled and preventative maintenance program processes.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE009B Scheduled maintenance process

Evidence shall show an understanding of maintenance processors to an extent indicated by the following aspects:

- Maintenance principles encompassing:
  - maintenance function
  - role of maintenance department
  - occupational health and safety requirements
- Maintenance systems encompassing:
  - maintenance terminology
  - preventative maintenance
  - predictive maintenance
  - corrective maintenance
- Data acquisition encompassing:
  - plant history cards/files
  - inspection techniques
  - predictive maintenance
  - remote visual inspection
  - non-destructive testing
  - thermography
  - vibration analysis
  - oil analysis
- Maintenance plan encompassing:
  - characteristics of plant operation
  - assessment of failure characteristics
  - link failure characteristics to maintenance systems
  - identify production windows
  - resources

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REQUIRED SKILLS AND KNOWLEDGE

- labour
- materials
- establish plan
- implementation procedures
- Review of maintenance plan encompassing:
  - analysis of records
  - manual recording methods
- Computerised recording methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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EVIDENCE GUIDE

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Comply with scheduled and preventative maintenance program processes as described in 8) and including:

    A Interpreting maintenance schedule requirements correctly.

    B Following quality assurance and risk management compliance processes.

    C Following maintenance schedule.

    D Inspecting and evaluating apparatus for quality assurance and risk compliance.

    E Arranging for corrective action of non compliant apparatus.

    F Documenting maintenance work.

    G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In

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these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to complying with scheduled and preventative maintenance program processes.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to scheduled and preventative maintenance compliance processes of at least three different items of installed equipment in the any of the following electrotechnology disciplines.

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Lifts
- Mining, electrical
- Marine, electrical
- Refrigeration and Air Conditioning
- Uninterruptible power supplies (UPS)
- Stand alone generator sets
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE011C Manage risk in electrotechnology activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers managing risk related to OHS, environment, resources and financial viability. It encompasses identifying risk events, the likelihood and consequences of such events, evaluating risk, risk management planning and mitigation of risk.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Identify risks and develop management strategies.	1.1	OHS policies, processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent of a program or project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
	1.3	Potential, perceived and actual risk events are identified, documented and analysed, in consultation with risk professionals and appropriate other person(s) in accordance with organisation policies and procedures.
	1.4	Risk management methods, tools and techniques are used to assist in the analysis and reporting of identified risk events.
	1.5	Risk management techniques are used to analyse risk events, assess options and recommend risk approaches to appropriate person(s) for approval.
	1.6	Risk management processes and procedures are developed and agreed to by all stakeholders and communicated to ensure clarity of understanding and ongoing management of risk factors.
	1.7	OHS risk control measure are incorporated in the in the in the risk management strategies in compliance with organisation's OHS policy and regulations.
	1.8	Condition monitoring of plant and equipment and criteria for repair and/or replacement are incorporated in the risk management strategies
2 Implement and monitor risk management strategies.	2.1	Risk management processes and procedures are incorporated into work and project plans to ensure common approach achieving outcomes.
	2.2	Activities are monitored against programs and projects plans to identify and respond to variations in accordance with risk management processes and procedures.
	2.3	Agreed risk responses are implemented and plans modified to reflect changing project objectives in an environment of uncertainty.

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ELEMENT	PERFORMANCE CRITERIA	
3 Evaluate risk management strategies.	3.1	Project outcomes are reviewed with appropriate person(s) to determine effectiveness of risk management processes and procedures.
	3.2	Risk issues and recommended improvements are identified, documented and passed to appropriate person(s) for approval to incorporate them into ongoing programs and future program and project and plans.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and managing risk in electrotechnology activities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE011C **Risk management, application and techniques**

Evidence shall show an understanding of risk management to an extent indicated by the following aspects:

T1 The need for risk management within the broad project management framework

T2 Risk management methodologies, their capabilities, limitations, applicability and outcomes

T3 Uncertainty and the means of measurement

T4 The application of risk management tools and techniques

T5 Risk management in the context of the project life cycle and other project management functions

T6 Implementing risk management

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is

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best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Manage risk in electrotechnology activities as described in 8) and including:

A Identifying potential, perceived and actual risk events.

B Using risk management methods, tools and techniques in analysis and reporting.

C Incorporating in the risk management strategies OHS risk control measure and condition monitoring of plant and equipment with criteria for its repair and/or replacement.

D Incorporating risk management processes and procedures into program and project plans.

E Monitoring and responding risk events effectively.

F Identifying improvements and documenting recommendation for their inclusion in ongoing or future programs and projects.

G Dealing with unplanned events

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be

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clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to managing risk in electrotechnology activities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE012B Manage electrotechnology projects

UEENEEE013B Plan electrotechnology projects

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in managing risk in relation to a program or an individual project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE012B Manage electrotechnology projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the management of electrotechnology projects involving design, modifications, installation and or maintenance of systems and equipment. It encompasses management of safety, budget, variations, personnel, resources and critical path timelines and necessary progress and completion documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the scope of the electrotechnology project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Project deliverables and budget are established from project planning and other relevant documentation and from discussions with appropriate person(s).
	1.3	Measurable outcomes are identified to evaluate the electrotechnology project on completion from project planning and other relevant documentation.
	1.4	Plant, materials and skills needed to meet project outcomes are established from project planning and other relevant documentation.
	1.5	Processes and procedures are developed for managing contract variations from discussions with appropriate person(s) and in accordance with contractual agreement.
2 Manage and implement the electrotechnology project.	2.1	OHS policies, procedures and programs are implemented and monitored.
	2.2	Achievement of electrotechnology project outcomes is delegated to appropriately competent persons involved in the project.
	2.3	Risk events are identified and project strategies implemented to ensure that outcomes are achieved to standard of quality specified in the contract and to safety standards required by organisation's policy.
	2.4	Procurement processes and procedures are monitored to ensure on-time supply of plant and materials and in accordance with organisation policy.
	2.5	Verification of the project technical design, modification, installation, and/or maintenance of system and equipment parameters is frequently made against specifications and established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Project is progress is monitored against schedule, quality requirements and budget.
	2.7	Conflict issues at the work site and between stakeholders, clients and regulators are identified and managed in accordance with organisation's policy.
	2.8	Variations are managed in accordance with agreed processes and in accordance with the contract.
	2.9	Project records are maintained and progress reports written and forwarded to all appropriate person(s).
3 Complete electrotechnology project.	3.1	Project outcomes are reviewed against original plan, implemented risk strategies, contract variations, safety record and budget.
	3.2	Project completion acceptance is sought from appropriate person(s) and hand-over documented in accordance with organisation policy.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and managing electrotechnology projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE012B Electro project management

Evidence shall show an understanding of project management concepts and customer/client relations to an extent indicated by the following aspects:

T1 Defining project parameters

Note:

Examples may include: Project scope; Project stakeholders and clients; Project phases and the relationship between phases; Time requirements and limitations; Resource requirements and limitations; Quality requirements and limitations.

T2 Time management

Note:

Examples may include: time management concepts; standard practices for ensuring a project runs to time and the like.

T3 Financial management

Note.

Examples may include: Financial management concepts; Standard practices for managing project finances; Project budgets; Costs, variations and estimations; Invoicing against project phases/deliverables; Acquittals and the like.

T4 Quality management

Note.

Examples may include: Quality management concepts; Standard practices for managing quality within a project.

T5 Human Resource management

Note.

Examples may include: human resource management concepts; standard practices for managing personnel within a project

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REQUIRED SKILLS AND KNOWLEDGE

T6 Communication management

Note.

Examples may include: Communication management concepts; Standard practices for managing communication within a project and the like.

T7 Risk management and contingencies

Note.

Examples may include: risk management concepts; standard practices for managing risk within a project; Internal risks; External risks; Risk minimisation; Risk removal; Contingencies and the like.

T8 Procurement management

Note.

Examples may include: procurement management concepts; standard practices for managing procurement and the like.

9 Physical Resource management

Note.

Examples may include: Types of physical resource, including; Equipment, Technology, Information, Facilities; Physical resource management concepts; Standard practices for managing physical resources

T10 Contracts

Note.

Examples may include: Understanding project contracts; Standard practices for working to contract specifications; Contract format; Contract content; Legal obligations of contract parties; Accompanying documentation including; Contract Schedules and the like.

T11 Performance assessment and continuous improvement

Note.

Examples may include: standard performance assessment practices; standard continuous improvement practices and the like

T12 Engineering ethics principles

T13 Importance of customer/client relations encompassing:

- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.2)

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evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Manage electrotechnology projects as described in 8) and including:

    A Establishing the scope of the project accurately.

    B Ascertaining the input of a project.

    C Developing effective management processes.

    D Managing resources and variations effectively.

    E Resolving conflicts.

    F Adopting risk management strategies.

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G Maintaining records and submitting progress reports.

H Meeting project outcomes.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to managing electrotechnology projects.

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EVIDENCE GUIDE

Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in managing an electrotechnology project in relation to a program or an individual project involving design, modifications, installation and or maintenance of systems and equipment having the following attributes:

- management of safety
- budget
- variations
- personnel
- resources and critical path timelines
- necessary progress
- completion documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE013B Plan electrotechnology projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1)**

1.1) Descriptor

This unit covers development and documentation of project proposals, milestones and completions. The unit encompasses, establishing budgets, critical path analysis, development of workflow strategies, documenting, presenting and negotiating budgets and timelines.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to plan project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for project planning are reviewed are adopted in accordance with organisation policies.
	1.3	The extent of the project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
2 Develop project plan proposal.	2.1	Estimated plant, material, labour and other costs are sought and obtained from appropriate person(s) in accordance with organisation policies and procedures.
	2.2	Project budget is established from estimated plant, material, labour and other costs in accordance with organisation policies and procedures.
	2.3	Knowledge of critical path analysis is applied to developing workflow strategies.
	2.4	Sources and availability of materials and human resources needed for the project are established in accordance with organisation policies and procedures.
	2.5	Risk management strategies are sought and obtained for incorporating in the project plan.
	2.6	Project plan is reviewed against all inputs and adjusted to rectify any anomalies.
	2.7	Project plan proposal is documented in accordance with organisation policies and procedures.
3 Obtain approval for project plan.	3.1	Project plan is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the project plan resulting from the presentation/discussion are negotiated with person(s) of higher authority within the

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ELEMENT	PERFORMANCE CRITERIA	
		constraints of organisation policy.
	3.3	Final project plan is documented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning electrotechnology projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE013B Electro project planning

Evidence shall show an understanding of project planning and critical path analysis to an extent indicated by the following aspects:

T1 Purpose of project planning

T2 Documents needed to plan a project

T3 Factors influencing sequence and restraints of project activities

T4 Critical path analysis encompassing:

- Graphical representation methods
- Methods of representing time/rates

T5 Purpose of critical path analysis

T6 Essential data

T7 Relational sequence of work activities

T8 Graphical representation methods

T9 Methods of representing time/rates

T10 Monitoring methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction

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EVIDENCE GUIDE

with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria

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Critical aspects of evidence required to demonstrate competency in this

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan electrotechnology projects as described in 8) and including:

    A Determining the project requirements accurately.

    B Establishing a project budget.

    C Developing effective work flow strategies.

    D Documenting project plan proposal.

    E Negotiating alterations to the proposed project plan successfully.

    F Obtaining approval of the final plan.

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Critical aspects of evidence required to demonstrate competency in this

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to planning electrotechnology projects.

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Critical aspects of evidence required to demonstrate competency in this	**9.2)** Before the critical aspects of evidence are considered all prerequisites must be met.
Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to planning any project incorporating any of the following electrotechnology disciplines and cost in excess of $100k.

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE015B Develop design briefs for electrotechnology projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing requirement to be incorporated in to the design of electrotechnology projects. It encompasses determining the safety requirements to be met, establishing client expectations, ensuring cost effective solutions are pursued and documenting design requirements.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop design briefs.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for project planning are reviewed are adopted in accordance with organisation policies.
	1.3	The scope of the project is evaluated and project parameters established using a formal evaluation/survey processes.
	1.4	Criteria from other related works impacting on the project are determined from specification of other work, site visits and/or discussion with appropriate person(s).
	1.5	Project budget is established by setting realistic expectations of deliverables and in consideration of tangible quality differences that result in the deliver the best value.
2 Develop design briefs.	2.1	Design brief is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
	2.2	Design brief is developed in collaboration with all relevant design professionals and contractors involved in the project.
	2.3	Competent persons required for the project are identified and their roles specified in the design brief.
	2.4	Project design brief is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Project design brief proposal is documented in accordance with organisation policies and procedures.
3 Obtain approval for design briefs.	3.1	Project design brief is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the project design brief resulting from the presentation/discussion are negotiated

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ELEMENT	PERFORMANCE CRITERIA	
		with person(s) of higher authority within the constraints of organisation policy.
	3.3	Final project design brief is documented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing design briefs for electrotechnology projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE015B Electro project design briefs

Evidence shall show an understanding of enterprise customer relations protocols to an extent indicated by the following aspects:

T1 Purpose of customer relations encompassing:

- Procedures for dealing with customers
- Dealing with customer issues

T2 Purpose of critical path analysis encompassing:

- Essential data
- Relational sequence of work activities
- Graphical representation methods
- Methods of representing time/rates
- Monitoring methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably

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gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop design briefs for electrotechnology projects as described in 8) and including:

    A Establishing the scope and parameters of the project.

    B Determining the impact of other related works.

    C Developing design brief incorporating scenarios and all requirements.

    D Identifying competencies required for the project.

    E Documenting project plan proposal.

    F Negotiating alterations to the proposed design brief successfully.

    G Obtaining approval of the final brief.

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used

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to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing design briefs for electrotechnology projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing requirements to be incorporated in to the design of electrotechnology projects with the following attributes:

- safety requirements met
- client expectations established
- cost effective solutions are pursued and assured
- design requirements documentation

Developing a project design brief incorporating shall be demonstrated in any of the following electrotechnology disciplines:

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE020B Provide basic instruction in the use of electrotechnology apparatus

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers instructing customers/users in the use of electrotechnology apparatus. It encompasses appropriate customer relations, the use of apparatus manufacturer's instruction material, basic instruction methods and evaluation and completing documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to instruct users.	1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Apparatus on which users are to be instructed is confirmed with work supervisor and/or other appropriate person(s).
	1.4	Safety features and safe use of the apparatus are reviewed by and understood.
	1.5	Familiarity with the apparatus is gained by reference to manufacturer's user material and a preliminary run through to ensure the process is understood.
	1.6	Materials required to instruct are obtained in accordance with established routines and procedures.
2 Instruct users.	2.1	Users are informed of all the safety features and safe use of the apparatus in accordance with manufacturer's instruction and regulatory requirements.
	2.2	Users are instructed in the set up and use of the apparatus in accordance with manufacturer's instruction.
	2.3	Users are given the opportunity to show that they understand the safety aspects, set up features and operation of the apparatus.
	2.4	A copy of the apparatus manufacturer's user instruction and other related documentation is given the appropriate person(s).
	2.5	Procedures for referring non-routine events to immediate supervisor for directions are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Instructions are given efficiently without damage to apparatus, the surrounding environment or services and using sustainable energy practices.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing basic instruction in the use of electrotechnology apparatus

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE20B User instructions techniques

Evidence shall show an understanding of instructing users in the use of specific items of equipment and systems to an extent indicated by the following aspects:

T1 Methods for evaluating user needs - how equipment is used efficiently and safely and identifying wear and tear and damage to the equipment that requires repairing.

T2 Basic instruction methods - appropriate to the culture of the users and the equipment for which instruction is given.

T3 Methods for evaluating user's ability use equipment correctly

T4 Communicating with personnel encompassing:

- Oral communications
- Written procedures and work instructions

T5 Communicating with suppliers

T6 Communicating with customers

T7 Purpose and extent of maintaining work activities records in an enterprise encompassing:

- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

T8 Customer relations encompassing:

- Purpose
- Procedures for dealing with customers
- Dealing with customer issues

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.2)

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evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide basic instruction in the use of electrotechnology apparatus as described in 8) and including:

    A Following manufacturer's user instructions.

    B Giving clear instructions in the use of the apparatus.

    C Giving users the opportunity to show that they understand the safe use of the apparatus.

    D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic

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assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing basic instruction in the use of electrotechnology apparatus.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with other related

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other units units making up a qualification or possible skill clusters covering a unit or units that require formal documentation.

Components of this unit are included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any single item of electrotechnology apparatus and its control.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE038B Participate in development and follow a personal competency development plan

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of skills and knowledge in taking responsibility for one's own competency development. It encompasses understanding the structure of a competency development plan, participating the development of a personal competency development plan, understanding responsibilities and obligation under competency development plan, following activities for developing competency, self-monitoring competency development and meeting trainee obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit

2)

This unit is intended to support competency development entry-level employment and post qualification based programs incorporated in approved contracts of training and approved programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly

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related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills	**5)**
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Participate in the development of a personal competency development plan.	1.1	The nature of competency-based training is sought from discussions with appropriate persons and understood.
	1.2	The responsibilities/obligations of trainees/learners, their employers, trainers and assessors in a competency-based development program are sought from discussions with appropriate persons and understood.
	1.3	Competencies to be achieved in a personal competency development plan are established in discussions with appropriate persons.
	1.4	Details on how to achieve the individual competencies in the plan are sought from discussions with appropriate persons and understood.

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ELEMENT	PERFORMANCE CRITERIA	
2 Follow a personal competency development plan.	2.1	All aspects of the competency development plan are put into practice and followed diligently.
	2.2	Opportunities to practise skills and apply knowledge relative to a particular competency are pursued
	2.3	Assistance is sought from appropriate persons to overcome difficulties in develop skills and apply knowledge relevant to a particular competency.
	2.4	Progress in competency development is self monitored against the competency development plan.
	2.5	Modifications to the personal competency development plan are made in consultation with appropriate persons.
	2.6	Trainee/learners responsibility for periodic and timely reporting of competency development activities is followed.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE038B Responsibilities under a competency development plan

Evidence shall show an understanding of responsibilities under a competency development plan to an extent indicated by the following aspects:

- Competency Development (Training) Plans encompassing:
  - state/territories requirements (acts/regulations)
  - competency development (training) contracts
  - competency development (training) period
  - purpose of competency development (training) plans
  - process in developing competency development (training) plans
  - parties involved in the competency development (training) plan
- Qualification Structure encompassing:
  - scope of work
  - Training Packages - electrotechnology
  - competency standard units (CSUs)
  - structure of Qualification
  - off-Job Requirements
  - on-Job Requirements
- Responsibilities of Parties to the contract encompassing:
  - employer responsibilities
  - learner responsibilities
  - RTO responsibilities
  - State Training Authorities (STA)
- Electrotechnology Industry Career Opportunities encompassing:
  - industry Areas
  - qualification levels
  - career paths

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REQUIRED SKILLS AND KNOWLEDGE

- Industry customs and practices encompassing:
  - industry bodies – employer and employee representatives
  - regulatory bodies – including licensing/registration, OHS, IR, training authorities – apprentice/trainee regulation
  - vocational and technical education system – Australian Qualification Framework (AQF), credentials, Australian Qualification Training Framework (AQTF)
- Monitoring of Workplace Evidence encompassing:
  - workplace exposure and practices and relationship with competency standard units
  - methods of collecting workplace evidence
  - monitoring period cycle
  - requirements of workplace evidence
  - actions taken for unsatisfactory progression
  - role of state training authority (STA)
  - apprentice/learner responsibilities
  - employer responsibilities
- RTO Policies encompassing:
  - apprentice/Learner Responsibilities
  - teachers/Trainers Responsibilities
  - absenteeism
  - off-Job component assessment specifications
  - on-Job component assessment specifications
  - qualification completion requirements and award
  - advanced standing and/or RPL
  - result review procedures
- Apprentice/Learner Discipline Policy encompassing:
  - apprentices/Learners rights
  - apprentice/Learner responsibilities
  - breaches of discipline
  - types of penalties Apprentice/Learner Responsibilities
- Attendance at the Vocational and Technical Education Centre encompassing:
  - importance of attendance
  - record management of attendance
  - attendance cards
  - advice to employer of absences
- Fire and Emergencies at the Vocational and Technical Education Centre encompassing:
  - designated fire and emergency exists

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REQUIRED SKILLS AND KNOWLEDGE

- procedures in the event of a fire
- evacuation procedures
- assembly points importance of attendance

- Occupational Health and Safety at the Vocational and Technical Education Centre encompassing:
  - eye protection
  - foot protection
  - protective clothing
  - personal injuries
  - mobile phones and personal belonging
  - dress regulations
  - rotating machinery, designated fire and emergency exists
- Entry Requirements encompassing:
  - numeracy requirements
  - literacy requirements
  - vocational and technical education centre support mechanisms
  - testing and appropriate action by learner Eye protection
- Vocational and Technical Education Centre Tour encompassing:
  - vocational and technical education centre layout
  - building layout
  - tour of building and vocational and technical education centre

KS02-EE038B Methods of monitoring and reporting competency development activities

- Evidence shall show an understanding of methods of monitoring and reporting workplace activities indicated by the following aspects:
- RTOs responsibility to receive and monitor workplace activities of the apprentice/learner
- Industry requirements for monitoring workplace evidence
- Acceptable methods for monitoring and reporting workplace activities
- Apprentice’s/Learner’s responsibility to participate in the reporting of workplace activities
- RTOs requirements in periodically evaluating development of apprentices/learners from the workplace activities information gathered, and providing feedback and advice on areas requiring improvement
- Employers responsibilities to participate in monitoring, reporting and confirming workplace activities, and assisting in overcoming areas requiring development by the apprentice/learner
- Options for appeal or assistance from RTO or State Training Authority (STA)

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.2)

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evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in development and follow a personal competency development plan as described in 8) and including:

    A Seeking and understanding the responsibilities under a competency development plan.

    B Seeking and understanding how to achieve the individual competencies in the plan.

    C Following all aspects of the plan diligently.

    D Pursuing opportunities to develop competency.

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EVIDENCE GUIDE

E Seeking assistance to overcome difficulties in developing competency.

F Self-monitoring competency development.

G Periodically reporting competency development activities.

H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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EVIDENCE GUIDE

Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** For optimisation of training and assessment effort, competence development in this unit may be assessed concurrently with other units in a qualification.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to participating in development and follow a personal competency development plan in an electrotechnology discipline with the following attributes:

- responsibility for one's own competency development in developing and applying skills and knowledge
- structure of a competency development plan
- development of a personal competency development plan participation
- responsibilities and obligation under the competency development plan
- activities for developing competency followed
- competency development self-monitoring
- trainee obligations met
- periodic reporting of competency development activities met

Participating in development and follow a personal competency development plan shall be demonstrated in any of the following Electrotechnology disciplines:

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE070B Write specifications for computer systems engineering projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing requirement to be incorporated into the writing of specifications for computer systems engineering projects. It encompasses determining the safety requirements to be met, establishing client expectations, ensuring cost effective solutions are pursued and documenting design and technical requirements.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare specification requirements.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for specification writing are reviewed are adopted in accordance with organisation policies.
	1.3	The scope of the specification is established using a formal evaluation/survey processes.
	1.4	Criteria from other related works impacting on the specification are determined from other relevant documentation, site visits and/or discussion with appropriate person(s).
2 Write specification.	2.1	Specification is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
	2.2	Specification is developed in collaboration with all relevant design professionals and contractors involved in the project.
	2.3	Competent persons required for the project are identified and their roles specified in the specification.
	2.4	Specification is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Specification is developed in accordance with organisation policies and procedures.
3 Approval of specification is obtained.	3.1	Specification is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the specification resulting from the discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Specification is finalised and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and writing specifications for computer systems engineering projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE070B Computer systems engineering specification development

Evidence shall show an understanding of computer systems engineering specification writing to an extent indicated by the following aspects:

T1 Computer systems engineering specifications encompassing:

- Purpose and nature of specification
- Performance based specifications
- Prescriptive specifications
- Acceptable evidence of compliance
- Additional service required with the supply of equipment

T2 Dealing with suppliers and manufacturer's encompassing:

- Documenting specification
- Customer/client relations encompassing:
- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T3 Using basic computers functions encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

T4 Research skills encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research - The history of research; past research successes; past research failures; Research Protocols; Research practices and the like.

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REQUIRED SKILLS AND KNOWLEDGE

- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
- Clients - identifying client viewpoints and stake in project; Identifying client requirements and parameters; Determining research budgets, timelines, milestones and quality attributes with clients.
- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment,

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the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Write specifications for computer systems engineering projects as described in 8) and including:

    A Establishing the scope and parameters of the specification.

    B Determining the impact of other related works.

    C Developing the specification incorporating scenarios and all requirements.

    D Identifying competencies required for the specification.

    E Writing specifications.

    F Negotiating alterations to the proposed specification successfully.

    G Obtaining approval of the final specification.

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to writing specifications for computer systems engineering projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing a specifications for at least one medium sized computer systems engineering project with the following attributes:

- safety requirements met
- client expectations established
- cost effective solutions pursued and assured
- design and technical requirements documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE071B Write specifications for electrical engineering projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing requirement to be incorporated into the writing of specifications for electrical engineering projects. It encompasses determining the safety requirements to be met, establishing client expectations, ensuring cost effective solutions are pursued and documenting design and technical requirements.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare specification requirements.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for specification writing are reviewed are adopted in accordance with organisation policies.
	1.3	The scope of the specification is established using a formal evaluation/survey processes.
	1.4	Criteria from other related works impacting on the specification are determined from other relevant documentation, site visits and/or discussion with appropriate person(s).
2 Write specification.	2.1	Specification is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
	2.2	Specification is developed in collaboration with all relevant design professionals and contractors involved in the project.
	2.3	Competent persons required for the project are identified and their roles specified in the specification.
	2.4	Specification is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Specification is developed in accordance with organisation policies and procedures.
3 Approval of specification is obtained.	3.1	Specification is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the specification resulting from the discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Specification is finalised and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and writing specifications for electrical engineering projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE071B Electrical engineering specification development

Evidence shall show an understanding of electrical engineering specification writing to an extent indicated by the following aspects:

T1 Electrical engineering specifications encompassing:

- Purpose and nature of specification
- Performance based specifications
- Prescriptive specifications
- Acceptable evidence of compliance
- Additional service required with the supply of equipment

T2 Dealing with suppliers and manufacturer's encompassing:

- Documenting specification
- Customer/client relations encompassing:
- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T3 Using basic computers functions encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

T4 Research skills encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research - The history of research; past research successes; past research failures; Research Protocols; Research practices and the like.

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REQUIRED SKILLS AND KNOWLEDGE

- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
- Clients - identifying client viewpoints and stake in project; Identifying client requirements and parameters; Determining research budgets, timelines, milestones and quality attributes with clients.
- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment,

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the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Write specifications for electrical engineering projects as described in 8) and including:

    A Establishing the scope and parameters of the specification.

    B Determining the impact of other related works.

    C Developing the specification incorporating scenarios and all requirements.

    D Identifying competencies required for the specification.

    E Writing specifications.

    F Negotiating alterations to the proposed specification successfully.

    G Obtaining approval of the final specification.

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to writing specifications for electrical engineering projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing specifications for at least one medium sized electrical engineering project with the following attributes:

- safety requirements met
- client expectations established
- cost effective solutions pursued and assured
- design and technical requirements documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE072B Write specifications for electronics and communications engineering projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers developing requirement to be incorporated into the writing of specifications for electronics and communication engineering projects. It encompasses determining the safety requirements to be met, establishing client expectations, ensuring cost effective solutions are pursued and documenting design and technical requirements.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare specification requirements.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for specification writing are reviewed and adopted in accordance with organisation policies.
	1.3	The scope of the specification is established using a formal evaluation/survey processes.
	1.4	Criteria from other related works impacting on the specification are determined from other relevant documentation, site visits and/or discussion with appropriate person(s).
2 Write specification.	2.1	Specification is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
	2.2	Specification is developed in collaboration with all relevant design professionals and contractors involved in the project.
	2.3	Competent persons required for the project are identified and their roles specified in the specification.
	2.4	Specification is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Specification is developed in accordance with organisation policies and procedures.
3 Approval of specification is obtained.	3.1	Specification is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the specification resulting from the discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Specification is finalised and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and writing specifications for electronics and communications engineering projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE072B Electronics and communications engineering specification development

Evidence shall show an understanding of electronics and communications engineering specification writing to an extent indicated by the following aspects:

T1 Electronics and communications engineering specifications encompassing:

- Purpose and nature of specification
- Performance based specifications
- Prescriptive specifications
- Acceptable evidence of compliance
- Additional service required with the supply of equipment

T2 Dealing with suppliers and manufacturer's encompassing:

- Documenting specification
- Customer/client relations encompassing:
- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T3 Using basic computers functions encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

T4 Research skills encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research - The history of research; past research successes;

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REQUIRED SKILLS AND KNOWLEDGE

past research failures; Research Protocols; Research practices and the like.

- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
- Clients - identifying client viewpoints and stake in project; Identifying client requirements and parameters; Determining research budgets, timelines, milestones and quality attributes with clients.
- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced

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by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Write specifications for electronics and communications engineering projects as described in 8) and including:

    A Establishing the scope and parameters of the specification.

    B Determining the impact of other related works.

    C Developing the specification incorporating scenarios and all requirements.

    D Identifying competencies required for the specification.

    E Writing specifications.

    F Negotiating alterations to the proposed specification successfully.

    G Obtaining approval of the final specification.

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to writing specifications for electronics and communications engineering projects

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing a specification for at least one medium sized electronics and communications engineering project with the following attributes:

- safety requirements met
- client expectations established
- cost effective solutions pursued and assured
- design and technical requirements documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Electrotechnology

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UEENEEE073B Write specifications for refrigeration and air conditioning engineering projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers developing requirement to be incorporated into the writing of specifications for refrigeration and air conditioning engineering projects. It encompasses determining the safety requirements to be met, establishing client expectations, ensuring cost effective solutions are pursued and documenting design and technical requirements.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare specification requirements.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for specification writing are reviewed and adopted in accordance with organisation policies.
	1.3	The scope of the specification is established using a formal evaluation/survey processes.
	1.4	Criteria from other related works impacting on the specification are determined from other relevant documentation, site visits and/or discussion with appropriate person(s).
2 Write specification.	2.1	Specification is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
	2.2	Specification is developed in collaboration with all relevant design professionals and contractors involved in the project.
	2.3	Competent persons required for the project are identified and their roles specified in the specification.
	2.4	Specification is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Specification is developed in accordance with organisation policies and procedures.
3 Approval of specification is obtained.	3.1	Specification is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the specification resulting from the discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Specification is finalised and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and writing specifications for refrigeration and air conditioning engineering projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE073B Refrigeration and air conditioning engineering specification development

Evidence shall show an understanding of refrigeration and air conditioning engineering specification writing to an extent indicated by the following aspects:

T1 Refrigeration and air conditioning engineering specifications encompassing:

- Purpose and nature of specification
- Performance based specifications
- Prescriptive specifications
- Acceptable evidence of compliance
- Additional service required with the supply of equipment

T2 Dealing with suppliers and manufacturer's encompassing:

- Documenting specification
- Customer/client relations encompassing:
- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T3 Using basic computers functions encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

T4 Research skills encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research - The history of research; past research successes;

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REQUIRED SKILLS AND KNOWLEDGE

past research failures; Research Protocols; Research practices and the like.

- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
- Clients - identifying client viewpoints and stake in project; Identifying client requirements and parameters; Determining research budgets, timelines, milestones and quality attributes with clients.
- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced

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EVIDENCE GUIDE

by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Write specifications for refrigeration and air conditioning engineering projects as described in 8) and including:

    A Establishing the scope and parameters of the specification.

    B Determining the impact of other related works.

    C Developing the specification incorporating scenarios and all requirements.

    D Identifying competencies required for the specification.

    E Writing specifications.

    F Negotiating alterations to the proposed specification successfully.

    G Obtaining approval of the final specification.

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to writing specifications for refrigeration and air conditioning engineering projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing a specification for at least one medium sized refrigeration and air conditioning engineering project with the following attributes:

- safety requirements met
- client expectations established
- cost effective solutions pursued and assured
- design and technical requirements documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Electrotechnology

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UEENEEE074B Write specifications for renewable energy engineering projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers developing requirement to be incorporated into the writing of specifications for renewable energy engineering projects. It encompasses determining the safety requirements to be met, establishing client expectations, ensuring cost effective solutions are pursued and documenting design and technical requirements.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare specification requirements.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for specification writing are reviewed and adopted in accordance with organisation policies.
	1.3	The scope of the specification is established using a formal evaluation/survey processes.
	1.4	Criteria from other related works impacting on the specification are determined from other relevant documentation, site visits and/or discussion with appropriate person(s).
2 Write specification.	2.1	Specification is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
	2.2	Specification is developed in collaboration with all relevant design professionals and contractors involved in the project.
	2.3	Competent persons required for the project are identified and their roles specified in the specification.
	2.4	Specification is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Specification is developed in accordance with organisation policies and procedures.
3 Approval of specification is obtained.	3.1	Specification is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the specification resulting from the discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Specification is finalised and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and writing specifications for renewable energy engineering projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE074B Renewable energy engineering specification development

Evidence shall show an understanding of renewable energy engineering specification writing to an extent indicated by the following aspects:

T1 Renewable energy engineering specifications encompassing:

- Purpose and nature of specification
- Performance based specifications
- Prescriptive specifications
- Acceptable evidence of compliance
- Additional service required with the supply of equipment

T2 Dealing with suppliers and manufacturer's encompassing:

- Documenting specification
- Customer/client relations encompassing:
- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T3 Using basic computers functions encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

T4 Research skills encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research - The history of research; past research successes;

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REQUIRED SKILLS AND KNOWLEDGE

past research failures; Research Protocols; Research practices and the like.

- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
- Clients - identifying client viewpoints and stake in project; Identifying client requirements and parameters; Determining research budgets, timelines, milestones and quality attributes with clients.
- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced

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EVIDENCE GUIDE

by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Write specifications for renewable energy engineering projects as described in 8) and including:

    A Establishing the scope and parameters of the specification.

    B Determining the impact of other related works.

    C Developing the specification incorporating scenarios and all requirements.

    D Identifying competencies required for the specification.

    E Writing specifications.

    F Negotiating alterations to the proposed specification successfully.

    G Obtaining approval of the final specification.

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to writing specifications for renewable energy engineering projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing a specification for at least one medium sized renewable energy engineering project with the following attributes:

- safety requirements met
- client expectations established
- cost effective solutions pursued and assured
- design and technical requirements documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Electrotechnology

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UEENEEE075B Write specifications for industrial electronics and control projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers developing requirement to be incorporated into the writing of specifications for industrial electronics and control projects. It encompasses determining the safety requirements to be met, establishing client expectations, ensuring cost effective solutions are pursued and documenting design and technical requirements.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare specification requirements.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for specification writing are reviewed and adopted in accordance with organisation policies.
	1.3	The scope of the specification is established using a formal evaluation/survey processes.
	1.4	Criteria from other related works impacting on the specification are determined from other relevant documentation, site visits and/or discussion with appropriate person(s).
2 Write specification.	2.1	Specification is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
	2.2	Specification is developed in collaboration with all relevant design professionals and contractors involved in the project.
	2.3	Competent persons required for the project are identified and their roles specified in the specification.
	2.4	Specification is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Specification is developed in accordance with organisation policies and procedures.
3 Approval of specification is obtained.	3.1	Specification is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the specification resulting from the discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Specification is finalised and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and writing specifications for industrial electronics and control projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE075B Industrial electronics and control engineering specification development

Evidence shall show an understanding of industrial electronics and control engineering specification writing to an extent indicated by the following aspects:

T1 Industrial electronics and control engineering specifications encompassing:

- Purpose and nature of specification
- Performance based specifications
- Prescriptive specifications
- Acceptable evidence of compliance
- Additional service required with the supply of equipment

T2 Dealing with suppliers and manufacturer's encompassing:

- Documenting specification
- Customer/client relations encompassing:
- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T3 Using basic computers functions encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

T4 Research skills encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research - The history of research; past research successes;

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REQUIRED SKILLS AND KNOWLEDGE

past research failures; Research Protocols; Research practices and the like.

- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
- Clients - identifying client viewpoints and stake in project; Identifying client requirements and parameters; Determining research budgets, timelines, milestones and quality attributes with clients.
- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced

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EVIDENCE GUIDE

by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Write specifications for industrial electronics and control projects as described in 8) and including:

    A Establishing the scope and parameters of the specification.

    B Determining the impact of other related works.

    C Developing the specification incorporating scenarios and all requirements.

    D Identifying competencies required for the specification.

    E Writing specifications.

    F Negotiating alterations to the proposed specification successfully.

    G Obtaining approval of the final specification.

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to writing specifications for industrial electronics and control engineering projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing a specification for at least one medium sized industrial electronics and control project with the following attributes:

- safety requirements met
- client expectations established
- cost effective solutions pursued and assured
- design and technical requirements documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Electrotechnology

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UEENEEE077B Write specifications for automated systems projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers developing requirement to be incorporated into the writing of specifications for automated systems projects. It encompasses determining the safety requirements to be met, establishing client expectations, ensuring cost effective solutions are pursued and documenting design and technical requirements.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare specification requirements.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for specification writing are reviewed and adopted in accordance with organisation policies.
	1.3	The scope of the specification is established using a formal evaluation/survey processes.
	1.4	Criteria from other related works impacting on the specification are determined from other relevant documentation, site visits and/or discussion with appropriate person(s).
2 Write specification.	2.1	Specification is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
	2.2	Specification is developed in collaboration with all relevant design professionals and contractors involved in the project.
	2.3	Competent persons required for the project are identified and their roles specified in the specification.
	2.4	Specification is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Specification is developed in accordance with organisation policies and procedures.
3 Approval of specification is obtained.	3.1	Specification is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the specification resulting from the discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Specification is finalised and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and writing specifications for automated systems projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE077B Automated systems engineering specification development

Evidence shall show an understanding of automated systems engineering specification writing to an extent indicated by the following aspects:

T1 Automated systems engineering specifications encompassing:

- Purpose and nature of specification
- Performance based specifications
- Prescriptive specifications
- Acceptable evidence of compliance
- Additional service required with the supply of equipment

T2 Dealing with suppliers and manufacturer's encompassing:

- Documenting specification
- Customer/client relations encompassing:
- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T3 Using basic computers functions encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

T4 Research skills encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research - The history of research; past research successes;

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REQUIRED SKILLS AND KNOWLEDGE

past research failures; Research Protocols; Research practices and the like.

- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
- Clients - identifying client viewpoints and stake in project; Identifying client requirements and parameters; Determining research budgets, timelines, milestones and quality attributes with clients.
- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced

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EVIDENCE GUIDE

by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Write specifications for automated systems projects as described in 8) and including:

    A Establishing the scope and parameters of the specification.

    B Determining the impact of other related works.

    C Developing the specification incorporating scenarios and all requirements.

    D Identifying competencies required for the specification.

    E Writing specifications.

    F Negotiating alterations to the proposed specification successfully.

    G Obtaining approval of the final specification.

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above in Context of and specific resources for assessment, evidence should show demonstrated competency in writing specifications for automated systems projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing a specification for at least one medium sized automated systems project with the following attributes:

- safety requirements met
- client expectations established
- cost effective solutions pursued and assured
- design and technical requirements documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Electrotechnology

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UEENEEE078B Contribute to risk management in electrotechnology systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers contributing to the management of risk in electrotechnology systems related to OHS, environment, resources and financial viability. It encompasses contributing to the identification of electrotechnology systems risks; and risk events, the likelihood and consequences of such events, evaluating risk, risk management planning and mitigation of risk.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and, where applicable contracts of training such as apprenticeships or approved competency development programs.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Contribute to the identification of risks and development of management strategies	1.1	OHS policies, processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent of a program or project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
	1.3	Potential, perceived and actual risk events and electrotechnology systems risks are identified, documented and analysed, in consultation with appropriate other person(s) in accordance with organisation policies and procedures.
	1.4	Risk management methods, tools and techniques are used to assist in the analysis and reporting of identified risk events.
	1.5	Risk management techniques are used to analyse electrotechnology systems risks and risk events, assess options and recommend risk approaches to appropriate person(s) for approval.
	1.6	Draft risk management processes and procedures are developed and communicated with all stakeholders to ensure understanding of management of risk factors.
	1.7	Risk management processes and procedures are submitted to appropriate person(s) for approval in accordance with established procedures.
	1.8	OHS risk control measures are submitted for incorporation in the risk management strategies in compliance with organisation's OHS policy and regulations.
2 Contribute to the implementation and monitoring of risk management strategies.	2.1	Risk management processes and procedures are produced and submitted for incorporation into work and project plans to ensure common approach achieving outcomes.
	2.2	Activities are monitored against programs and

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ELEMENT		PERFORMANCE CRITERIA	
			projects plans to identify and responses submitted to appropriate person(s) for approval for variations in accordance with risk management processes and established procedures.
		2.3	Agreed risk responses are revised for implementation and plans modified following approval to reflect changing project objectives in an environment of uncertainty, in accordance with risk management processes and established procedures..
3	Contribute to the evaluation of risk management strategies.	3.1	Project outcomes are reviewed with appropriate person(s) to determine effectiveness of risk management processes and established procedures.
		3.2	Risk issues and recommended improvements are identified, documented and submitted to appropriate person(s) for approval to incorporate them into ongoing programs and future program and project and plans.
		3.3	Outcomes are documented and recorded/stored in accordance established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the managing of risk in electrotechnology activities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE078B Principles of risk management, applications, practices and techniques

Evidence shall show an understanding of principles of risk management, applications, practices and techniques to an extent indicated by the following aspects:

T1 Risk Management principles encompassing:

- models including reasonable and practicable
- hazard and risk
- safety and health
- safety risk including Injury Causation Model and Error Agencies
- health Risk including Occupational Hygiene Model
- hierarchy of Controls (Engineering and Administrative)

T2 Principles of risk management planning

T3 Principles of risk Assessment - planning and prioritisation

T4 Principles of risk mitigation – handling and monitoring

T5 Principles of risk management procedures encompassing:

- OHS practices – general, training, manual handling, and specific technical/occupational, organisational procedures
- OHS networks
- Hazard control and reporting
- Incident notification
- Emergency procedures and first aid

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package

Critical aspects of evidence required

9.**2**)

Before the critical aspects of evidence are considered all

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EVIDENCE GUIDE

to demonstrate competency in this unit

prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Contribute to risk management in electrotechnology systems as described in 8) and including:

    A Contributing to identifying potential, perceived and actual risk events.

    B Using risk management methods, tools and techniques to assist in the analysis and reporting.

    C Contributing to incorporation of risk management processes and procedures into program and project plans.

    D Contributing to the monitoring and responding to electrotechnology systems and risk events

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effectively.

E Identifying improvements and documenting recommendation for their inclusion in ongoing or future programs and projects.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to contributing to risk management in electrotechnology systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH041B	Manage electronics/computer systems projects

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in contributing to the management of risk in electrotechnology systems related to OHS, environment, resources and financial viability with the following attributes:

- electrotechnology systems risks identification
- risk events
- likelihood and consequences of risk events
- evaluating risk
- risk management planning
- mitigation of risk for a program or an individual project
- technical requirements documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Electrotechnology

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UEENEEE080A Apply industry and community standards to engineering activities

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the industry and community standards expected of engineers. It encompasses knowledge and application of ethical and community standards, seeking advise regarding broader implications of engineering works, adopting appropriates technologies and engaging in current engineering issues.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 6 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not requires a license to practice in the workplace. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as cadetships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Review ethical and community standards and processes	1.1	Ethical standards of relevant professional bodies are reviewed and understood.
		1.2	Advice on the application processes for applying ethical, community and technical standards is obtained from persons of higher authority.
		1.3	Contributions to periodic revision of standards is made through formal discussions with colleagues and written submissions to public reviews.
2	Apply ethical and community standards and processes	2.1	Established ethical standards are apply to all professional dealings and activities.
		2.2	Work is planed and managed within the framework of community and technical standards.
		2.3	Compliance with relevant community and technical standards is incorporated in assuring quality of work

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ELEMENT	PERFORMANCE CRITERIA	
		outcomes.
	2.4	Advice on engineering issues and adoption of particular technologies with regard to standards is sought from persons of higher authority.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of industry and community standards expected of engineers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE080A Ethical standards and their application

Evidence shall show an understanding of ethical standards and their application to an extent indicated by the following aspects:

T1 Purpose of ethical standards.

T2 The common tenets of ethical standards.

T3 Ethical standards of professional bodies in the electrotechnology industry

T4 Application of ethical standards

KS02-EE080A Development of community standards

Evidence shall show an understanding of the development of community standards to an extent indicated by the following aspects:

T1 Purpose of standards and how they are applied

T2 Difference between ‘standards’, ‘codes of practice’ and ‘guidelines’

T3 Legal implications of ‘standards’, ‘codes of practice’ and ‘guidelines’

T4 Standards development organisations and compliance systems

T5 Standards development process and community involvement.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this

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EVIDENCE GUIDE

Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work

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function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

A Reviewing and understanding ethical standards

B Seeking advice on applying standards

C Contributing to periodic review of standards

D Working ethically

E Ensuring work outcomes are compliant with relevant standards

F Seeking advice on engineering issues and adoption of particular technologies with regard to standards

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to industry and community standards expected of engineers.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with other core units an AQF 6 qualification or higher. Examples are:

UEENEEG069B	Manage electrical projects
UEENEEG070B	Plan electrical projects

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to a qualification at AQF 6 level or higher

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Electrotechnology

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UEENEEE081A Apply material science to solving electrotechnology engineering problems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the application of materials for a specific purpose in electrotechnology. It encompasses working safely, knowledge of materials science including classifications, characteristics and any impact a material may have on health and the environment, the processes of corrosion and degradation, how particular materials are used, solving electrotechnology problems involving of materials for a particular application and documenting justification for such solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to apply material science to developing solutions to electrotechnology problems.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the purpose and environment in which the materials are to be used is obtained and understood from documentation or from work supervisor.
	1.4	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Apply material science to developing solutions to electrotechnology problems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	Tests and measurements are undertaken in strict accordance with OHS requirements and within established safety procedures.
	2.3	Solutions to electrotechnology problems draw upon knowledge of material science, including tests and measurements and interpreting their results.
	2.4	Effects of particular environments on materials and visa versa and known health risks are considered in resolving electrotechnology problems.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
3 Report the solutions to electrotechnology problems.	3.1	Proposed solutions to electrotechnology problems are documented with science based justification for the solutions.
	3.2	Known health risks exposed by a material and/or its application are included in the report.
	3.3	Proposed solution report is forwarded to the appropriate person in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of material science in electrotechnology.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE081A Materials science in electrotechnology

Evidence shall show an understanding of base materials to an extent indicated by the following aspects:

T1 Classification, nature and physical properties of materials used in electrotechnology

- Solids
- Liquids
- gases

T2 Dielectric strength and dielectric breakdown, examples to include applications using solids, liquids, gases and vacuum

T3 Conductors and semiconductors

- materials
- applications, including photo voltaic and hv insulation

T4 Chemical effects on materials

- cells, including fuel cells
- electrolysis
- corrosion
- safety

T5 Material processing and manufacturing.

T6 Environment and health issues

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction

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with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered

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EVIDENCE GUIDE

holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Evaluate base materials as described in 8) and including:

    A Obtaining and understanding nature of the electrotechnology problem and environment in which the materials are to be used

    B Appropriate tools, equipment and testing devices are selected

    C Using knowledge of the material science, tests and measurement results effectively.

    D Considering environment and health risks

    E Clearly documenting proposed solutions and their scientific justification

    G Dealing with unplanned events

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Context of and specific resources for assessment	**9.3)** This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include: • OHS policy and work procedures and instructions. • Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit. These should be used in the formal learning/assessment environment. Note: Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy. The resources used for assessment should reflect current industry practices in relation to material science in electrotechnology.
Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to least three electrotechnology problems involving the use of particular materials.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.3) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.3) Literacy and numeracy skills

Competency Field **5**)

Electrotechnology

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UEENEEE082A Apply physics to solving electrotechnology engineering problems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the law of physics and how they apply to solving electrotechnology related problems. It encompasses working safely, knowledge of measurements of physical phenomena, linear and angular motion, harmonic motion, wave theory, optics, acoustics and heat capacity and transfer, use of measurement techniques, solving physics related problems and documenting justification for such solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to apply physics to developing solutions to electrotechnology related problems.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the problem is obtained and understood from documentation or from work supervisor.
	1.4	Problems are clearly stated in writing and/or diagrammatic form to ensure they are understood and appropriate methods used to resolve them.
	1.5	Equipment and testing devices needed to develop solutions to problems are obtained and checked for correct operation and safety

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ELEMENT	PERFORMANCE CRITERIA	
2 Apply the laws of physics to developing solutions to electrotechnology problems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	Tests and measurements are undertaken in strict accordance with OHS requirements and within established safety procedures.
	2.3	Knowledge of laws of physics are drawn to develop resolutions problems in static and dynamics including tests and measurements and interpreting their results.
	2.4	Theoretical and measured values are applied to developing solutions to problems in static and dynamics
	2.5	Consideration is given to adverse effects in the developed solutions of problems
	2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
3 Report solutions of problems in static and dynamics	3.1	Proposed solutions to electrotechnology problems are documented with science based justification for the solutions..
	3.2	Known adverse effects and outcome of developed solution are included in the report
	3.3	Solution report is forwarded to the and appropriate person notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of physics and how they apply to solving electrotechnology related problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE082A Electrotechnology engineering physics

Evidence shall show an understanding of electro engineering physics to an extent indicated by the following aspects:

T1 Measurement encompassing

- SI units in measurement of physical phenomena
- Uncertainty and tolerance

T2 Linear motion

T3 Angular motion

T4 Simple harmonic motion and vibration

T5 Wave theory

- Interference
- Diffraction

T6 Electromagnetic waves and propagation

T7 Optics

- Mirrors and lenses
- Optical fibre

T8 Acoustics and ultrasonics

T9 Heat capacity and heat transfer

- Fluid power

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

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competency in this unit

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop solution to problems in statics and dynamics as described in 8) and including:

A Understanding and clearly stating the nature of the problem

B Obtaining the appropriate equipment and testing devices needed to develop solutions to problems

C Using knowledge of laws of physics are drawn to develop resolutions problems in static and dynamics

D Applying theoretical and measured values to developing solutions to problems in static and dynamics

E Consideration is given to adverse effects in the developed solutions

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F Reporting accurately the developed solutions, recommendations and justification

G Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to physics and how they apply to solving electrotechnology related problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing solution to problems involving linear and angular motion, harmonics, wave propagation, interference and diffraction, electromagnetic wave propagation, optics acoustics and heat capacity and transfer.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.3) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.3) Literacy and numeracy skills

Competency Field **5**)

Electrotechnology

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UEENEEE083A Establish and follow a competency development plan in an electrotechnology engineering discipline

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers establishing and following a plan for one's own competency development. It encompasses establishing a plan in consultation with the enrolling registered training organisation (RTO), following industry/enterprise procedures regarding how work is conducted, understanding responsibilities and obligations under competency development plan, following activities for developing competency, pursuing opportunities to develop competencies, to self-monitoring competency development and meeting obligations for periodic reporting of competency development activities.

Application of the Unit

Application of the Unit **4**)

This unit applies to a recognised development program that leads to the acquisition of a formal award at AQF level 6

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a licence to practise in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable a contracts of training.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Establish a competency development plan	1.1	A competency development plan incorporating course work, assessment scheme and workplace activities is established in consultation with the enrolling RTO.
		1.2	Obligations and expectations of the competency development plan are obtained and understood.
2	Comply with engineering industry/enterprise workplace policies and procedures	2.1	Industry/enterprise workplace policies and procedures for all work activities are obtained and understood.
		2.2	Work instructions are followed, any clarification involved being sought from the immediate supervisor/appropriate person.
		2.3	Unexpected situations are dealt with safely and in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person.
3	Monitor and respond to a personal competency development plan.	3.1	All aspects of the competency development plan are confirmed in consultation with appropriate persons.
		3.2	All components of the competency development plan are followed diligently.
		3.3	Opportunities to practise skills and apply knowledge relative to a particular competency are pursued.
		3.4	Assistance is sought from appropriate persons to overcome difficulties in developing skills and applying knowledge relevant to a particular competency.
		3.5	Progress in competency development is self-monitored against the competency development plan and industry/enterprise policies and procedures.
		3.6	Modifications to the personal competency development plan are made in consultation with appropriate persons.
		3.7	Obligations are met for the regular and accurate reporting of competency development activities as per industry/enterprise policies and procedures.
		3.8	Periodic competency development activities report is validated by an appropriate person in accordance with

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ELEMENT	PERFORMANCE CRITERIA
	industry/enterprise policies and procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and participating in development and following a personal competency development plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE083A Engineering competency development

Evidence shall show an understanding of engineering competency development to an extent indicated by the following aspects:

T1 Components of a competency development plan encompassing:

- Competencies to be achieved
- Course work and timetable
- Assessment scheme
- Aspects of competency to be developed in the workplace
- Methods of monitoring and recording relevant workplace activities.

T2 Obligations and expectations under a competency development plan

T3 Scope for industry/enterprise policies and procedures

- Policies and procedure related to safety, effective work outcomes, customer relations, conflict resolution and competency development.
- Monitoring and reporting work activities.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of 9.1)

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EVIDENCE GUIDE

Assessment

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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EVIDENCE GUIDE

shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Participate in electrical work and competency development activities as described in 8) including:

A Establishing a competency development plan in consultation with the enrolling Registered Training Organisation (RTO).

B Understanding obligations and expectations of the competency development plan.

C Understand industry/enterprise workplace policies and procedures

D Following work instructions and seeking clarification of how particular work is to be carried out and the procedures involved.

E Dealing with unexpected situations in accordance with industry/enterprise policies and procedures, and with the approval of an authorised person

F Reporting periodically the competency development activities in accordance with requirements

G Periodically reviewing progress of the competency development activities in accordance with requirements

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H Pursuing strategies to develop opportunities for gaining the range of workplace experiences and exposure

I Progressing successfully against periodic or staged evaluative performance events

G Seeking assistance to overcome difficulties in developing competency

K Dealing with unplanned events.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to participating in development and following a personal competency development plan.

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Method of assessment	**9**.**4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9**.**5**) This unit shall be assessed concurrently with other units in a qualification.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to other units in an advance diploma qualification to contribute the evidence used in evaluating when competency has been sufficiently demonstrated. The unit applies to both the educational program provided by a registered training organisation and real work under a formal training agreement.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Commercial

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UEENEEE084A Write specifications for electrotechnology engineering projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers developing requirement to be incorporated into the writing of specifications for electrotechnology engineering projects. It encompasses determining the safety requirements to be met, establishing client expectations, ensuring cost effective solutions are pursued and documenting design and technical requirements.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare specification requirements.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for specification writing are reviewed are adopted in accordance with organisation policies.
	1.3	The scope of the specification is established using a formal evaluation/survey processes.
	1.4	Criteria from other related works impacting on the specification are determined from other relevant documentation, site visits and/or discussion with appropriate person(s).
2 Write specification.	2.1	Specification is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
	2.2	Specification is developed in collaboration with all relevant design professionals and contractors involved in the project.
	2.3	Competent persons required for the project are identified and their roles specified in the specification.
	2.4	Specification is reviewed against all inputs and adjusted to rectify any anomalies.
	2.5	Specification is developed in accordance with organisation policies and procedures.
3 Approval of specification is obtained.	3.1	Specification is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the specification resulting from the discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Specification is finalised and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and writing specifications for electrical engineering projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE084B Electrotechnology engineering specification development

Evidence shall show an understanding of specification writing to an extent indicated by the following aspects:

T1 Engineering specifications encompassing:

- Purpose and nature of specification
- Performance based specifications
- Prescriptive specifications
- Acceptable evidence of compliance
- Additional service required with the supply of equipment

T2 Dealing with suppliers and manufacturer's encompassing:

- Documenting specification
- Customer/client relations encompassing:
- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T3 Using basic computers functions encompassing:

- Starting up
- Selecting application
- Entering information
- Saving
- Printing

T4 Research skills encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research - The history of research; past research successes;

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REQUIRED SKILLS AND KNOWLEDGE

past research failures; Research Protocols; Research practices and the like.

- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
- Clients - identifying client viewpoints and stake in project; Identifying client requirements and parameters; Determining research budgets, timelines, milestones and quality attributes with clients.
- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced

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EVIDENCE GUIDE

by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Write specifications for electrical engineering projects as described in 8) and including:

    A Establishing the scope and parameters of the specification.

    B Determining the impact of other related works.

    C Developing the specification incorporating scenarios and all requirements.

    D Identifying competencies required for the specification.

    E Writing specifications.

    F Negotiating alterations to the proposed specification successfully.

    G Obtaining approval of the final specification.

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to writing specifications for electrotechnology engineering projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing specifications for at least one medium sized electrotechnology engineering project with the following attributes:

- safety requirements met
- client expectations established
- cost effective solutions pursued and assured
- design and technical requirements documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Electrotechnology

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UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit specifies the mandatory requirements of occupational health and safety and how they apply to the various electrotechnology work functions. It encompasses responsibilities for health and safety, risk management processes at all operative levels and adherence to safety practices as part of the normal way of doing work.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4)**

This unit addresses information, processes and techniques for the application of general occupational health and safety requirements in workplaces and is essential for employees without managerial or supervisory responsibilities

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to enter a work area	1.1	Work area access permits are obtained from appropriate personnel according to established procedures
		1.2	Safe work methods for controlling risk obtained, read and understood prior to undertaking a work activity.
		1.3.	Preparations for electrical and non-electrical isolation are carried out to prevent creation of hazards from loss of machine/system/process control according to established procedures.
		1.4	Tools and equipment needed for the work are checked for safety and correct functionality according to established procedures and regulatory requirements.
2	Apply safe working practices.	2.1	Safe work methods for controlling risk are followed accurately.
		2.2	Workplace procedures for dealing with accidents, fires and emergencies are followed according to work procedures and scope of responsibility and competencies.

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ELEMENT	PERFORMANCE CRITERIA	
3. Follow workplace procedures for hazard identification and risk control	3.1	Hazards are identified and control measures implemented and monitored through active participation in the consultation process with employer and other employees.
	3.2	Hazards in the work area are recognised and reported to appropriate personnel according to established procedures.
	3.3	OHS records of incidents are completed in accordance with regulatory requirements and established procedures.
	3.4	Workplace instructions and training are followed accurately within established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and applying OHS practices in the workplace.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE101A Occupational Health and Safety principles

Evidence shall show an understanding of Occupational Health and Safety to an extent indicated by the following aspects

T1 The basic legal requirements covering occupational health and safety in the workplace encompassing:

- underlying principles of OH&S
- general aims and objectives of the relevant state or territory legislation relating to OH&S.
- employer and employee responsibilities, rights and obligations.
- major functions of safety committees and representatives.
- powers given to Occupational Health and Safety Inspectors
- housekeeping and potential hazards in relation to improper housekeeping
- selecting appropriate personal protective equipment (PPE) given hazardous situations

T2 The work environment encompassing:

- typical hazards associated with a range of work environments
- procedures used to control the risks associated with these hazards
- principles of risk assessment / management and state the purpose of each.
- hierarchy of OH&S hazard control measures.
- required documentation for risk assessment.
- commonly used workplace safety signs.
- workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
- appropriate fire extinguisher for a given type of fire.
- requirements for the location, mounting and maintenance of portable fire extinguishers.
- basic process of fighting a fire.
- Importance of safe premises, buildings and security in an industrial setting and the consequences of non- compliance.

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REQUIRED SKILLS AND KNOWLEDGE

- standard work procedure.

T3 Manual Handling encompassing:

- typical manual handling injuries and the effect they can have on lifestyle
- situations that may cause manual handling injuries
- correct procedures for lifting and carrying to prevent manual handling injuries

T4 Chemicals in the workplace encompassing:

- hazardous substances and dangerous goods.
- classification of chemicals as hazardous substances and/or dangerous goods
- requirements for labelling of chemicals in the workplace
- safe storage procedures for chemicals
- purpose and interpretation of material safety data sheet (MSDS)

T5 Working at heights encompassing:

- dangers associated with working on ladders and scaffolds
- identification of work area as a height risk and use appropriate safety equipment to prevent a fall
- selecting an appropriate ladder for a given situation and perform a safety check before use
- precautions that should be taken when ascending and working off a ladder
- precautions that should be taken when working on and around a scaffold and elevated platforms.

T6 Confined spaces encompassing:

- hazards associated with working in a confined space
- identifying workplace situations that could be classified as a confined space
- control measures for working in a designated confined space

T7 Physical and psychological hazards encompassing:

- short and long term effects of excessive noise and techniques to avoid damage to hearing due to excessive noise
- effects of vibration on the human body and work practices to protect against vibration
- effects of thermal stress on the human body and work practices to protect against thermal stress
- effects of ultraviolet (UV) radiation on the human body and work practices to protect against UV radiation.
- dangers associated with laser operated equipment and tools and suitable protective measures to overcome the danger.
- occupational overuse syndrome, how it occurs and means to overcome it
- factors that cause stress in the workplace, symptoms of a person suffering from stress and personal stress management techniques
- detrimental effects and dangers of drug and alcohol use in the workplace

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REQUIRED SKILLS AND KNOWLEDGE

T8 Working safely with electricity encompassing:

- effects of electric shock on the human body
- common causes of electrical accidents
- precautions that can minimise the chance of electric shock (earthing, extra low voltage, fuses, circuit breakers and residual current devices – RCDs)
- protection offered by a residual current device (RCD)
- need for ensuring the (safe) isolation of an electrical supply
- appropriate method of removing an electric shock victim from a live electrical situation

T9 Life support - CPR in the workplace encompassing:

- First Aid.
- responsibilities of the First Aider.
- priorities of first aid management for any accident or injury.
- procedures required at an accident scene.
- legal and ethical issues, which may impact on the management of care.
- 'Duty of Care'.
- examination of a casualty for injuries.
- effect of cardio pulmonary arrest on the body.
- Managing simulated conditions of: airway obstruction; respiratory arrest and cardio pulmonary arrest,
- single and two-person cardio pulmonary resuscitation (CPR).
- signs and symptoms of an altered level of consciousness
- management of simulation of a casualty with an altered level of consciousness.
- signs and symptoms of shock.
- management of simulation of a casualty in shock

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9**.**1**) Longitudinal competency development approaches to

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assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline,

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work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement encompassing:
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Applying OHS practices in the workplace as described in 8) and including:

A Preparing to enter the workplace including, the use of work permits and clearances and isolation permissions.

B Understanding and following risk control safe work methods.

C Applying work procedures and instructions as they apply to risk control measures.

D Dealing with accidents and emergencies within the scope of responsibility.

E Participation in consultation processes, identifying hazards and implementing and monitoring control measures.

F Dealing with unplanned events

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Note:
Ability to implement these Occupation Health and Safety measures shall be demonstrated on all occasions safety issues arise.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to applying OHS practices in the workplace.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

This unit shall be assessed concurrently, as it relates to other units undertaken in a possible skill clusters or qualification.

Components of this unit are included in the critical aspects of

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evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to each of the following

- Relevant Occupational Health and Safety legislation, regulations and codes of practice related to hazards present in the industry and particular workplace
- Accepted industry work procedures and the specific safety procedures and work instructions for particular workplace.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Electrotechnology

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UEENEEE102A Fabricate, assemble and dismantle utilities industry components

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers basic fitting and fabrication techniques as they apply in the various utilities industry work functions. It encompasses the safe use of hand, fixed and portable power tools; cutting, shaping joining and fixing using metallic and non-metallic materials; dismantling and assembling equipment; basic mechanical measurement and marking-out and reading drawings/diagrams.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to persons entering work in utilities industry and may be used in school-based vocational programs.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for dismantling, assembling and fabrication work.	1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures

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ELEMENT	PERFORMANCE CRITERIA	
		in preparation for the work are followed.
	1.3	Safety hazard not previously identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature of the work is obtained from documentation and from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Materials required for the work are obtained in accordance with established routines and procedures.
	1.7	Tools, equipment and measuring devices needed to carry out the work are obtained and checked for correct operation and safety.
	1.8	Cutting tools such as drills and chisels are sharpened to suit the material on which they are to be used.
2 Dismantle and assemble utilities industry apparatus.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Appropriate tools are selected and used correctly and safely in dismantling and assembling apparatus.
	2.4	Manufacturer apparatus dismantling and assembling guides are used where applicable.
	2.5	Components are marked or tagged during the dismantling to help ensure correct and efficient reassembly.
	2.6	Dismantled components and parts are stored to protect them against loss or damage.
	2.7	Apparatus is dismantled and assembled efficiently without waste of materials and energy and/or damage to apparatus and the surrounding environment or services.

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ELEMENT	PERFORMANCE CRITERIA	
	2.8	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.9	Routine quality checks are carried out in accordance with work instructions.
	2.10	OHS risk control work completion measures and procedures are followed.
	2.11	Work site is cleaned and made safe in accordance with established procedures.
	2.12	Work supervisor is notified of the completion of the work in accordance with established procedures.
3 Fabricate utilities industry components.	3.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	3.3	Appropriate tools are selected and used correctly and safely in fabricating components.
	3.4	Drawings and instruction for the fabrication of components are followed.
	3.5	Component dimensions are determined directly or by calculation from information given in job drawings and instructions.
	3.6	Components are fabricated efficiently without waste of materials and energy and/or damage to the surrounding environment or services.
	3.7	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	3.8	Routine quality checks are carried out in accordance with work instructions.
	3.9	OHS risk control work completion measures and procedures are followed.
	3.10	Work site is cleaned and made safe in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA
	3.11 Work supervisor is notified of the completion of the work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and fabricating, dismantling, assembling of utilities industry components.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE102A Hand and power tools and their application

Evidence shall show an understanding of hand and power tools and their application to an extent indicated by the following aspects:

T1 Mechanical drawing interpretation and sketching encompassing:

- drawing standards and conventions used in drawings of mechanical components as specified in AS1100
- basic abbreviations and symbols used in drawing of mechanical components
- interpretation of mechanical drawings commonly used in the electrotechnology industry (orthogonal projection, third angle - detail and assembly drawings, pictorial views)
- laying out a drawing of mechanical components using engineering drawing convention.
- freehand drawings of mechanical components showing all information needed for its manufacture/fabrication

T2 Workshop planning and materials encompassing:

- methods used to work safely in an industrial work environment.
- typical non-electrical hazards in the workplace
- control measures for dealing with hazards identified.
- Conducting a risk assessment on a given work environment, documenting and assessing the risks identified
- type of metallic and non-metallic materials used in the electrotechnology industry and application of the common materials
- planning process

T3 Measuring and marking out encompassing:

- reasons for measuring and marking out
- tools used for marking out
- measuring and marking out a project accurately following correct procedures.
- sustainable energy work practices related to reducing waste when marking out.

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REQUIRED SKILLS AND KNOWLEDGE

T4 Holding and cutting encompassing:

- common tools for holding (bench vices, multi-grips, vice grips, wrenches).
- common tools for cutting metallic and non-metallic material (hacksaws, wood saws, chisels, pliers, files)
- procedure for using a range of tools for cutting, shaping, and finishing metallic and non-metallic materials
- safety procedures when using holding and cutting tools

T5 Drills and drilling encompassing:

- types of drills used in the electrotechnology industry
- sharpening twist drills
- drilling metallic and non-metallic components
- safe use of a bench drill

T6 Tapping and threading encompassing:

- type and size of commonly used threads used in electrotechnology work
- taps and tap wrenches
- tapping metallic and non-metallic components
- stock and die tools
- threading metallic and non-metallic components

T7 General Hand Tools encompassing:

- hammers used in electrotechnology work
- screwdrivers used in electrotechnology work
- spanners and sockets used in electrotechnology work
- pliers used in electrotechnology work
- assembling components applicable to electrotechnology industry using a variety of hand tools.

T8 Joining techniques encompassing:

- types of machine screws and nuts
- forms of welding (Oxy-acetylene, electric arc welding).
- forms of brazing and hard soldering
- process of soft soldering
- joining components using machine screws
- joining components using welding, brazing or soldering techniques

T9 Portable electric power tools encompassing:

- portable electric power tools (grinders, drills, jigsaws, saws)
- applications of portable electric power tools used in the electrotechnology work.
- using portable power tools.
- fabricating components using power tools (drills, grinders)

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REQUIRED SKILLS AND KNOWLEDGE

T10 Sheet metal work encompassing:

- types of sheet metal materials used in the electrotechnology work.
- names and applications of the types of fabrication materials.
- tools used with sheet metals in electrotechnology work (hacksaw, tinsnips, guillotines, punches, notching tools, folding machines)
- techniques used in fabricating sheet metal (cutting, bending, drilling/punching, joining, cutting mitres).
- marking out, cutting, bending, drilling and/or cutting and/or punching holes, joining and cutting mitred joints using sheet metal.
- sustainable energy work practices to reducing waste when fabricating using sheet metal.
- fabricating components using sheet metal and fabrication tools.

T11 Low tolerance measurement encompassing:

- tolerance
- techniques in using vernier callipers
- techniques in using micrometers.
- using vernier callipers to measure engineering components
- using micrometers to measuring engineering components

T12 Dismantling and assembly techniques encompassing:

- tools used in dismantling and assembling electrotechnology equipment (spanners, screwdrivers, bearing pullers, etc).
- procedures for ensuring the safe treatment of dismantled components.
- dismantling electrical, electronic, instrumentation or refrigeration/air conditioning piece of equipment using correct procedures.
- assembling electrical, electronic, instrumentation or refrigeration/air conditioning piece of equipment using correct procedures.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

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EVIDENCE GUIDE

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline,

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EVIDENCE GUIDE

work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Fabricate, dismantle, assemble of utilities industry components as described in 8) and including:

A Selecting and using hand tools appropriate to a task correctly and safely

B Selecting and using power tools appropriate to a task correctly and safely

C Sharpening at least two drill bits each for use different types of material.

D Interpreting mechanical drawings/diagrams and instructions correctly.

E Dismantle and assemble an apparatus relevant to utilities industry discipline in which competency is sought.

F Fabricate a component relevant to the utilities industry discipline in which competency is sought.

G Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to dismantling, assembling and fabricating utilities industry components.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installation, fault finding, maintenance, repair or development work functions in any of the following disciplines:

- Electrotechnology Disciplines
- Gas industry Disciplines
- ESI Transmission, Distribution and Rail Disciplines
- ESI Generation Disciplines

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.3) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.3) Literacy and numeracy skills

Competency Field **5**)

Utilities industry

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UEENEEE103A Solve problems in ELV single path circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers providing known solutions to predictable problems in single path circuits operated at extra-low voltage (ELV) as they apply to various energy sector work functions. It encompasses working safely, problem solving procedures, including the use of basic voltage, current and resistance measuring devices, providing known solutions to predictable circuit problems.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in the energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However they are subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on extra-low voltage single path electrical circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve problem in extra-low voltage single path electrical circuits.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established routines are used to solve circuit problems using measured and calculated values

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ELEMENT	PERFORMANCE CRITERIA	
		as they apply to single path, single source circuits.
	2.5	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established routine procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in extra-low voltage single path circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE103A Single Path d.c. Circuits

Evidence shall show an understanding of single path d.c. circuits to an extent indicated by the following aspects:

T1 Basic electrical concepts encompassing:

- electrotechnology industry
- static and current electricity
- production of electricity by renewable and non renewable energy sources
- transportation of electricity from the source to the load via the transmission and distribution systems
- utilisation of electricity by the various loads
- basic calculations involving quantity of electricity, velocity and speed with relationship to the generation and transportation of electricity.

T2 Basic electrical circuit encompassing:

- symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in a circuit diagram
- purpose of each component in the circuit
- effects of an open-circuit, a closed-circuit and a short-circuit
- multiple and sub-multiple units

T3 Ohm’s Law encompassing:

- basic d.c. single path circuit.
- voltage and currents levels in a basic d.c. single path circuit.
- effects of an open-circuit, a closed-circuit and a short-circuit on a basic d.c. single path relationship between voltage and current from measured values in a simple circuit
- determining voltage, current and resistance in a circuit given any two of these quantities
- graphical relationships of voltage, current and resistance
- relationship between voltage, current and resistance

T4 Electrical power encompassing:

- relationship between force, power, work and energy
- power dissipated in circuit from voltage, current and resistance values

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REQUIRED SKILLS AND KNOWLEDGE

- power ratings of devices
- measurement electrical power in a d.c. circuit
- effects of power rating of various resistors

T5 Effects of electrical current encompassing:

- physiological effects of current and the fundamental principles (listed in AS/NZS 3000) for protection against the this effect
- basic principles by which electric current can result in the production of heat; the production of magnetic fields; a chemical reaction
- typical uses of the effects of current
- mechanisms by which metals corrode
- fundamental principles (listed in AS/NZS3000) for protection against the damaging effects of current

T6 EMF sources energy sources and conversion electrical energy encompassing:

- basic principles of producing a emf from the interaction of a moving conductor in a magnetic field.
- basic principles of producing an emf from the heating of one junction of a thermocouple.
- basic principles of producing a emf by the application of sun light falling on the surface of photovoltaic cells
- basic principles of generating a emf when a mechanical force is applied to a crystal (piezo electric effect)
- principles of producing a electrical current from primary, secondary and fuel cells
- input, output, efficiency or losses of electrical systems and machines
- effect of losses in electrical wiring and machines
- principle of conservation of energy

T7 Resistors encompassing:

- features of fixed and variable resistor types and typical applications
- identification of fixed and variable resistors
- various types of fixed resistors used in the Electro technology Industry. e.g. wire-wound, carbon film, tapped resistors.
- various types of variable resistors used in the Electro technology Industry e.g. adjustable resistors: potentiometer and rheostat; light dependent resistor (LDR); voltage dependent resistor (VDR) and temperature dependent resistor (NTC, PTC).
- characteristics of temperature, voltage and light dependent resistors and typical applications of each
- power ratings of a resistor.
- power loss (heat) occurring in a conductor.
- resistance of a colour coded resistor from colour code tables and confirm the value by measurement.
- measurement of resistance of a range of variable’ resistors under varying

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REQUIRED SKILLS AND KNOWLEDGE

conditions of light, voltage, temperature conditions.

- specifying a resistor for a particular application.

T8 Series circuits encompassing:

- circuit diagram of a single-source d.c. ‘series’ circuit.
- Identification of the major components of a ‘series’ circuit: power supply; loads; connecting leads and switch
- applications where ‘series’ circuits are used in the Electro technology industry.
- characteristics of a ‘series’ circuit - connection of loads, current path, voltage drops, power dissipation and affects of an open circuit in a ‘series’ circuit.
- the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities
- relationship between voltage drops and resistance in a simple voltage divider network.
- setting up and connecting a single-source series dc circuit
- measurement of resistance, voltage and current values in a single source series circuit
- effect of an open-circuit on a series connected circuit

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency

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in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in extra-low voltage single path circuits as described in 8) and including:

A	Determining the operating parameters of an existing circuit.
B	Altering an existing circuit to comply with specified operating parameters.
C	Developing circuits to comply with a specified function and operating parameters.
D	Identifying loss of supply.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solve problems in extra-low voltage single path circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- Single source single path circuits as they apply to problems related to installation, fault finding, maintenance or development work functions in any of the following disciplines:
  - Computers
  - Data Communications
  - Electrical
  - Electronics
  - Fire protection
  - Instrumentation
  - Refrigeration and Air Conditioning,
  - Renewable and sustainable energy systems, and
  - Security technology
- In relation to at least three of the following types of circuit problems and on at least two occasions:
  - Determining the operating parameters of an existing circuit
  - Identifying and locating open-circuits
  - Identifying and locating short-circuits
  - Identifying loss of supply

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE104A Solve problems in d.c. circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers determining correct operation of single source d.c. series, parallel and series-parallel circuits and providing solutions as they apply to various electrotechnology work functions. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in single and multiple path circuits.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on d.c. electrical circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	The nature of the circuit problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve d.c. circuit problems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methodological techniques are used to solve d.c. circuit problems from measure and calculated values as they apply to electrical circuit.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in d.c. circuits.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE104A Direct current circuits

Evidence shall show an understanding of electrical fundamentals and direct current multiple path circuits to an extent indicated by the following aspects:

T1 Basic electrical concepts encompassing:

- electrotechnology industry
- static and current electricity
- production of electricity by renewable and non renewable energy sources
- transportation of electricity from the source to the load via the transmission and distribution systems
- utilisation of electricity by the various loads
- basic calculations involving quantity of electricity, velocity and speed with relationship to the generation and transportation of electricity.

T2 Basic electrical circuit encompassing:

- symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in a circuit diagram
- purpose of each component in the circuit
- effects of an open-circuit, a closed-circuit and a short-circuit
- multiple and sub-multiple units

T3 Ohm’s Law encompassing:

- basic d.c. single path circuit.
- voltage and currents levels in a basic d.c. single path circuit.
- effects of an open-circuit, a closed-circuit and a short-circuit on a basic d.c. single path relationship between voltage and current from measured values in a simple circuit
- determining voltage, current and resistance in a circuit given any two of these quantities
- graphical relationships of voltage, current and resistance
- relationship between voltage, current and resistance

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REQUIRED SKILLS AND KNOWLEDGE

T4 Electrical power encompassing:

- relationship between force, power, work and energy
- power dissipated in circuit from voltage, current and resistance values
- power ratings of devices
- measurement electrical power in a d.c. circuit
- effects of power rating of various resistors

T5 Effects of electrical current encompassing:

- physiological effects of current and the fundamental principles (listed in AS/NZS 3000) for protection against the this effect
- basic principles by which electric current can result in the production of heat; the production of magnetic fields; a chemical reaction
- typical uses of the effects of current
- mechanisms by which metals corrode
- fundamental principles (listed in AS/NZS3000) for protection against the damaging effects of current

T6 EMF sources energy sources and conversion electrical energy encompassing:

- basic principles of producing a emf from the interaction of a moving conductor in a magnetic field.
- basic principles of producing an emf from the heating of one junction of a thermocouple.
- basic principles of producing a emf by the application of sun light falling on the surface of photovoltaic cells
- basic principles of generating a emf when a mechanical force is applied to a crystal (piezo electric effect)
- principles of producing a electrical current from primary, secondary and fuel cells
- input, output, efficiency or losses of electrical systems and machines
- effect of losses in electrical wiring and machines
- principle of conservation of energy

T7 Resistors encompassing:

- features of fixed and variable resistor types and typical applications
- identification of fixed and variable resistors
- various types of fixed resistors used in the Electro technology Industry. e.g. wire-wound, carbon film, tapped resistors.
- various types of variable resistors used in the Electro technology Industry e.g. adjustable resistors: potentiometer and rheostat; light dependent resistor (LDR); voltage dependent resistor (VDR) and temperature dependent resistor (NTC, PTC).
- characteristics of temperature, voltage and light dependent resistors and typical applications of each
- power ratings of a resistor.
- power loss (heat) occurring in a conductor.

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REQUIRED SKILLS AND KNOWLEDGE

- resistance of a colour coded resistor from colour code tables and confirm the value by measurement.
- measurement of resistance of a range of variable' resistors under varying conditions of light, voltage, temperature conditions.
- specifying a resistor for a particular application.

T8 Series circuits encompassing:

- circuit diagram of a single-source d.c. 'series' circuit.
- Identification of the major components of a 'series' circuit: power supply; loads; connecting leads and switch
- applications where 'series' circuits are used in the Electro technology industry.
- characteristics of a 'series' circuit - connection of loads, current path, voltage drops, power dissipation and affects of an open circuit in a 'series' circuit.
- the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities
- relationship between voltage drops and resistance in a simple voltage divider network.
- setting up and connecting a single-source series dc circuit
- measurement of resistance, voltage and current values in a single source series circuit
- effect of an open-circuit on a series connected circuit

T9 Parallel circuits encompassing:

- schematic diagram of a single-source d.c. 'parallel' circuit.
- major components of a 'parallel' circuit (power supply, loads, connecting leads and switch)
- applications where 'parallel' circuits are used in the Electrotechnology industry.
- characteristics of a 'parallel' circuit. (load connection, current paths, voltage drops, power dissipation, affects of an open circuit in a 'parallel' circuit).
- relationship between currents entering a junction and currents leaving a junction
- relationship between branch currents and resistances in a two branch current divider network.
- calculation of the total resistance of a 'parallel' circuit.
- calculation of the total current of a 'parallel' circuit.
- Calculation of the total voltage and the individual voltage drops of a 'parallel' circuit.
- setting up and connecting a single-source d.c. parallel circuit
- resistance, voltage and current measurements in a single-source parallel circuit
- voltage, current, resistance or power dissipated from measured values of any of these quantities
- output current and voltage levels of connecting cells in parallel.

T10 Series/parallel circuits encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- schematic diagram of a single-source d.c. 'series/parallel' circuit.
- major components of a 'series/parallel' circuit (power supply, loads, connecting leads and switch)
- applications where 'series/parallel' circuits are used in the Electrotechnology industry.
- characteristics of a 'series/parallel' circuit. (load connection, current paths, voltage drops, power dissipation, affects of an open circuit in a 'series/parallel' circuit).
- relationship between voltages, currents and resistances in a bridge network.
- calculation of the total resistance of a 'series/parallel' circuit.
- calculation of the total current of a 'series/parallel' circuit.
- calculation of the total voltage and the individual voltage drops of a 'series/parallel' circuit.
- setting up and connecting a single-source d.c. series/ parallel circuit
- resistance, voltage and current measurements in a single-source d.c. series / parallel circuit
- the voltage, current, resistances or power dissipated from measured values of any two of these quantities

T11 Factors affecting resistance encompassing:

- four factors that affect the resistance of a conductor (type of material, length, cross-sectional area and temperature)
- affect the change in the type of material (resistivity) has on the resistance of a conductor.
- affect the change in 'length' has on the resistance of a conductor.
- affect the change in 'cross-sectional area' has on the resistance of a conductor.
- effects of temperature change on the resistance of various conducting materials
- effects of resistance on the current-carrying capacity and voltage drop in cables.
- calculation of the resistance of a conductor from factors such as conductor length, cross-sectional area, resistivity and changes in temperature
- using digital and analogue ohmmeter to measure the change in resistance of different types of conductive materials (copper, aluminium, nichrome, tungsten) when those materials undergo a change in type of material length, cross-sectional area and temperature.

T12 Effects of meters in a circuit encompassing:

- selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application.
- measuring resistance using direct, volt-ammeter and bridge methods.
- instruments used in the field to measure voltage, current, resistance and insulation resistance and the typical circumstances in which they are used.
- hazards involved in using electrical instruments and the safety control measures that should be taken.
- operating characteristics of analogue and digital meters.

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REQUIRED SKILLS AND KNOWLEDGE

- correct techniques to read the scale of an analogue meters and how to reduce the 'parallax' error.
- types of voltmeters used in the Electrotechnology industry – bench type, clamp meter, Multimeter, etc.
- purpose and characteristics (internal resistance, range, loading effect and accuracy) of a voltmeter.
- types of voltage indicator testers. e.g. LED, neon, solenoid, volt-stick, series tester, etc. and explain the purpose of each voltage indicator tester.
- operation of various voltage indicator testers.
- advantages and disadvantages of each voltage indicator tester.
- various types of ammeters used in the Electrotechnology industry – bench, clamp meter, multimeter, etc.
- purpose of an ammeter and the correct connection (series) of an ammeter into a circuit.
- reasons why the internal resistance of an ammeter must be extremely low and the dangers and consequences of connecting an ammeter in parallel and/or wrong polarity.
- selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application
- connecting an analogue/digital voltmeter into a circuit ensuring the polarities are correct and take various voltage readings.
- loading effect of various voltmeters when measuring voltage across various loads.
- using voltage indicator testers to detect the presence of various voltage levels.
- connecting analogue/digital ammeter into a circuit ensuring the polarities are correct and take various current readings.

T13 Resistance measurement encompassing:

- Identification of instruments used in the field to measure resistance (including insulation resistance) and the typical circumstances in which they are used.
- the purpose of an Insulation Resistance (IR) Tester.
- the parts and functions of various analogue and digital IR Tester (selector range switch, zero ohms adjustment, battery check function, scale and connecting leads).
- reasons why the supply must be isolated prior to using the IR tester.
- where and why the continuity test would be used in an electrical installation.
- where and why the insulation resistance test would be used in an electrical installation.
- the voltage ranges of an IR tester and where each range may be used. e.g. 250 V d.c, 500 V d.c and 1000 V d.c
- AS/NZS3000 Wiring Rules requirements – continuity test and insulation resistance (IR) test.
- purpose of regular IR tester calibration.
- the correct methods of storing the IR tester after use
- carry out a calibration check on a IR Tester

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REQUIRED SKILLS AND KNOWLEDGE

- measurement of low values of resistance using an IR tester continuity functions.
- measurement of high values of resistance using an IR tester insulation resistance function.
- volt-ammeter (short shunt and long shunt) methods of measuring resistance.
- calculation of resistance values using voltmeter and ammeter reading (long and short shunt connections)
- measurement of resistance using volt-ammeter methods

T14 Capacitors and Capacitance encompassing:

- basic construction of standard capacitor, highlighting the: plates, dielectric and connecting leads
- different types of dielectric material and each dielectric's relative permittivity.
- identification of various types of capacitors commonly used in the Electrotechnology industry (fixed value capacitors -stacked plate, rolled, electrolytic, ceramic, mica and Variable value capacitors – tuning and trimmer)
- circuit symbol of various types of capacitors: standard; variable, trimmer and polarised
- terms: Capacitance (C), Electric charge (Q) and Energy (W)
- unit of: Capacitance (Farad), Electric charge (Coulomb) and Energy (Joule)
- factors affecting capacitance (the effective area of the plates, the distance between the plates and the type of dielectric) and explain how these factors are present in all circuits to some extent.
- how a capacitor is charged in a d.c. circuit.
- behaviour of a series d.c. circuit containing resistance and capacitance components. - charge and discharge curves
- the term 'Time Constant' and its relationship to the charging and discharging of a capacitor.
- calculation of quantities from given information: Capacitance ($Q = VC$); Energy ($W = ½CV2$); Voltage ($V = Q/C$)
- calculation one time constant as well as the time taken to fully charge and discharge a given capacitor. ($\tau = RC$)
- connection of a series d.c. circuit containing capacitance and resistor to determine the time constant of the circuit

T15 Capacitors in Series and Parallel encompassing:

- hazards involved in working with capacitance effects and the safety control measures that should be taken.
- safe handling and the correct methods of discharging various size capacitors
- dangers of a charged capacitor and the consequences of discharging a capacitor through a person
- factors which determine the capacitance of a capacitor and explain how these factors are present in all circuits to some extent.
- effects of capacitors connected in parallel by calculating their equivalent capacitance.

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REQUIRED SKILLS AND KNOWLEDGE

- effects on the total capacitance of capacitors connected in series by calculating their equivalent capacitance.
- Connecting capacitors in series and/or parallel configurations to achieve various capacitance values.
- common faults in capacitors.
- testing of capacitors to determine serviceability.
- application of capacitors in the Electrotechnology industry.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to

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EVIDENCE GUIDE

be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solving problems in d.c. circuits as described in 8) and including:

    A Using methodological techniques to solve d.c. circuit problems from measure and calculated values

    B Determining the operating parameters of an existing circuit.

    C Altering an existing circuit to comply with specified operating parameters.

    D Developing circuits to comply with a specified function and operating parameters.

    E Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in d.c. circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to single source series, parallel and series-parallel d.c. circuits as they apply to problems related to installation, fault finding, maintenance or development work functions and at least two of the following types of circuit problems and on more than one occasions:

- Determining the operating parameters of an existing circuit
- Altering an existing circuit to comply with specified operating parameters
- Developing circuits to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5)**

Electrotechnology

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UEENEEE105A Fix and secure electrotechnology equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers fixing, securing and mounting techniques as apply in the various electrotechnology work functions. It encompasses the safe use of hand and portable power tools, safe lifting techniques, safe use of ladders and elevated platforms and the selection and safe application of fixing devices and supporting accessories/equipment.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical licence.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to fix and secure equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	The scope of work to be undertaken is obtained from documentation or from work supervisor.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
		1.6	Fixing devices are selected for their suitable ability for the environment, the load they are to support and substratum's into which they are to be installed.
		1.7	Supporting accessories/equipment is selected for suitability for the environment and ability to support and protect from damage that which they are intended to support.
		1.8	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Install fixing and support devices.	2.1	Electrical isolation is arranged where work is within arm's reach of exposed conductive parts, plant or machinery in strict accordance OHS requirements and procedures.
		2.2	Other OHS risk control measures relevant to the work site are followed.
		2.3	Fixing devices are installed in accordance with manufacturer instructions.
		2.4	Support accessories/equipment is install accurately and to comply with technical standards and job specifications.
		2.5	Work is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
3	Complete fixing and support work.	3.1	OHS risk control work completion measures and procedures are followed.
		3.2	Work site is tidied and tools and equipment cleaned

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ELEMENT	PERFORMANCE CRITERIA
	and securely stored.
	3.3 Appropriate personnel are notified of the work completion.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and fixing and securing equipment.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE105A Fixing and support devices/techniques

Evidence shall show an understanding of accessories and support and fixing device and methods and their use to an extent indicated by the following aspects:

T1. Device for securing and mounting electrical/electronic/instrumentation/refrigeration/ air-conditioning/telecommunications accessories for supporting, fixing and protecting wiring/cabling/piping and functional accessories to hollow walls encompassing:

- types and safe application of devices for hollow wall fixing and support
- methods/techniques used to fix/support to wood, hollow wall, masonry blocks, plasterboard, panelling
- types and safe application of fixing devices used in the electrotechnology industry for wood and hollow wall structures (wood screws, coach bolts, self-tappers, self drilling, metal thread, hollow wall anchors, behind plaster brackets, stud brackets, plasterboard devices, toggle devices)
- types of tools used for hollow wall fixing and supporting.
- using various fixing methods to fix/support to hollow walls.

T2. Device for securing and mounting electrical/electronic/instrumentation/refrigeration/ air-conditioning/telecommunications accessories for supporting, fixing and protecting wiring/cabling/piping and functional accessories to solid walls encompassing:

- types and safe application of devices used for solid wall fixing and support
- methods/techniques used in to fix to masonry and concrete structures
- fixing devices used in the electrotechnology industry for solid wall structures (wall-plugs, expanding concrete fixing devices, gas powered fixing tools, powder actuated fixing tools, loxins, dynabolts, chemical devices)
- regulatory requirements for use of powder fixing tools.
- hand and power tools used in fixing and supporting accessories
- using various fixing methods to fix/support to solid walls

T3. Device for securing and mounting

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REQUIRED SKILLS AND KNOWLEDGE

electrical/electronic/instrumentation/refrigeration/ air-conditioning/telecommunications accessories for supporting, fixing and protecting wiring/cabling/piping and functional accessories to metal fixing encompassing:

- accessories that may be fixed to metal (saddle clips, conduits, brackets, switches)
- techniques for fixing to metal
- fixing devices: coach bolts, self-tappers, metal thread bolts, hollow wall anchors, rivets
- fixing tools - spanners, screwdrivers, power screw drivers, pop riveters, files, reamers
- OH&S issues related to drilling, cutting, eye protection, metal filings, swarf, noise
- Using power drills, drill bits, change drill speeds.
- Install a fixing device and accessory capable of supporting up to 20 kg on the metal plate.

T4. Securing and mounting electrical/electronic/instrumentation/refrigeration/ air-conditioning/telecommunications accessories for supporting, fixing and protecting wiring/cabling/piping and functional accessories using fixing adhesives and tapes encompassing:

- types and safe application of using adhesives and tapes as fixing devices (load limits of different commercial products)
- accessories that may be fixed using adhesives and tapes
- techniques for the application of adhesives and tapes
- tools used to apply and cut adhesives and tapes
- hazards and safety measures when working with adhesives and chemical fixing devices (fumes, cutting, eye protection, physical contact, hand protection, ingestion)

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably

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EVIDENCE GUIDE

gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Fix and secure electrical equipment as described in 8) and including:

    A Selecting fixing for loads of < 5 kg, < 20 kg and < 50 kg and suitable for the environment in which they are to be installed.

    B Installing fixing devices in compliance with manufacturers instructions

    C Installing appropriate devices for fixing to a hollow wall, brick, concrete and steel.

    D Installing fixing support accessories/equipment relevant the discipline in which competency is sought.

    E Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to fixing and securing electrical equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units covering other installation competencies.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installation, fault finding, maintenance or development work functions in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5)**

Electrotechnology

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UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the use of drawings, diagrams, cable schedules, standards, codes and specifications as they apply to the various electrotechnology work functions. It encompasses the rudiments for communicating with schematic, wiring and mechanical diagrams and equipment and cable/connection schedules, manuals, site and architectural drawings and plans showing the location of services, apparatus, plant and machinery and understanding the use and format of compliance standards and job specifications.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to use drawings, diagrams, schedules and manuals.	1.1	Established OHS risk control measures and procedures are followed.
	1.2	The need for drawings, diagrams, schedules or manuals is determined from the nature of the work to be undertaken.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Established routines and procedures are followed to obtain drawings, diagrams, schedules or manuals required for the work to be undertaken.
2	Use drawings, diagrams, schedules and manuals to obtain job information.	2.1	Drawings, diagrams, schedules and/or manuals are selected, appropriate to the work being undertaken.
		2.2	Drawings, diagrams and schedules are interpreted using knowledge of drawing layouts, conventions and symbols.
		2.3	Dimensions are extracted from drawings and diagrams for application to work undertaken.
		2.4	Location of equipment is determined from equipment schedules and location diagrams.
		2.5	Manuals are reviewed to ascertain their format and where information relevant to the work to be undertaken is located.
		2.6	Information given in manuals is interpreted in relation to the work to be undertaken.
3	Use drawings, diagrams, schedules and manuals to convey information and ideas.	3.1	Drawing conventions are used in neat freehand drawings to convey information and ideas to others involved in the work to be undertaken.
		3.2	Drawing conventions are used to neatly correct freehand original job drawing to show final 'as-installed' arrangement.
		3.3	Corrected drawings are forwarded to appropriate person(s) in accordance with established procedures.
4	Prepare to use compliance standards, codes and specifications.	4.1	Compliance Standards and Codes that apply to particular disciplines are sought and obtained.
		4.2	The format of compliance Standards and Codes that apply to particular disciplines are reviewed and understood.
		4.3	The purpose and format and typical content of job specifications are reviewed and understood.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and using drawings, diagrams, cable schedules, standards, codes and specifications.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE107A Drawings, diagrams and schedules

Evidence shall show an understanding of drawings, diagrams and schedules used in electrotechnology work to an extent indicated by the following aspects:

T1 Architectural drawings encompassing:

- site plans, floor plans detailed drawings and standard drawings
- architectural floor plan to determine the power and lighting or communications / audio/ video layouts required in a domestic installation
- site plan to locate the service point, consumers mains, communication services, main switchboard, distribution boards and/or builders supplies.
- standard drawing scales to determine the actual lengths represented by dimensions on an architectural drawing.
- reading and interpretation of floor plans to determine the location of the electrical/ communication/audio accessories and appliances.
- Australian standard symbols used on floor plans to show the location of the accessories and appliances as detailed in an electrical schedule.

T2 Electrical drawings encompassing:

- types of electrical drawings: block, circuit, wiring and ladder diagrams
- purpose and application of block, circuit, wiring diagrams and ladder diagrams
- Australian standard symbols used to represent components on electrical diagrams.
- conventions used in and the features of circuit diagrams
- converting a circuit diagram to a wiring diagram
- identification of cable type, origin and route from a cable schedule.
- developing a cable schedule for a given installation.

T3 Circuit diagrams encompassing:

- purpose of circuit diagrams in the electrotechnology industry
- conventions used in and the features of circuit diagrams
- sketching basic circuit diagrams
- common symbols used in circuit diagram (Australian Drawing Standard AS/NZS 1102)

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REQUIRED SKILLS AND KNOWLEDGE

- developing switching charts to identify the terminals of various types of switches
- connecting equipment using circuit diagrams.

T4 Wiring diagrams encompassing:

- purpose of wiring diagrams in the electrotechnology industry
- conventions used in and the features of wiring diagrams
- sketching basic wiring diagrams
- common symbols used in wiring diagram (Australian Drawing Standard AS/NZS 1102)
- connecting equipment using wiring diagrams.

T5 Building construction drawings and diagrams encompassing:

- building types: timber frame, brick veneer, double brick and metal frame.
- identification of different types of: footings, floors, external walls, roofs, interior walls
- typical cable routes through buildings, structures and premises
- sequence of each constructional stage for brick, brick veneer and timber cottages
- identification of the stages at which the electrical/communications - first and second fixing occurs in the constructional sequence
- areas of cooperation between electrical/communications and other building trades

KS02-EE107A Introduction to regulations, compliance standards and codes

Evidence shall show an understanding of regulations, compliance standards and codes that apply to electrical work to an extent indicated by the following aspects:

T1 Regulation for undertaking electrical work encompassing:

- scope of work covered by licensing in the electrotechnology industry (Electrical licensing)
- legislative requirements for ensuring electrical or electronic equipment is safe i.e. compliance requirements of electrical installations

T2 Standards philosophy and format encompassing:

- performance verses prescriptive requirements
- purpose of technical standards and their development
- role of standards Australia/New Zealand, International Organisation for Standardisation (ISO) and the International Electrotechnical Commission (IEC)
- how standards are used in compulsory and accreditation compliance schemes.
- arrangement and use of technical standards in relation to electrical and electronic work
- how to read and apply a standard.
- Standards and codes that apply to all types of electrical installations
- Standards include Standards mandated under regulation (e.g. Wiring Rules) or by an authority, deemed-to-comply standard and local service requirements (e.g. Service rules).
- Codes include those applicable to electrical safe working practices and some aspects of

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REQUIRED SKILLS AND KNOWLEDGE

the Building Code of Australia.

T3 Purpose, format and content of typical job specifications encompassing:

- NATSPEC specification system - provide the most common templates on which job specification are written.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and

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EVIDENCE GUIDE

operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use drawings, diagrams, schedules, standards, codes and specifications as described in 8) Range and including:

    A Identifying drawings, diagrams, schedules and manuals relevant to the work to be undertaken.

    B Interpreting drawings, diagrams, schedules and manuals correctly.

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EVIDENCE GUIDE

C	Using correct conventions in freehand drawings.
D	Giving correct information in freehand drawings.
E	Obtaining compliance Standards and Codes applicable to particular disciplines
F	Reviewing and understanding the format of compliance Standards and Codes that apply to particular disciplines
G	Reviewing the format and content of typical job specifications.
H	Dealing with unplanned events

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to using drawings, diagrams, schedules and manuals.

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EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units covering the use of drawings, diagrams, schedules, standards, codes or specifications is required.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to assembly, installation, fault finding, maintenance or development work functions in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Electrotechnology

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UEENEEE108A Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the laying of wiring/cabling, connection of accessories and continuity and insulation resistance testing of circuits intended to operate at extra-low voltage. Typically this includes circuits and accessories for ELV powered devices, security, controls, integrated systems, audio/video systems. It encompasses the principles of single source, single load power circuits, control circuits and communications circuits, safe working practices and following work processes that satisfy electrical principles for safety and functionality.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to lay wiring/cabling and connect accessories for extra-low voltage circuits.	1.1	OHS procedures for a given work area are obtained and understood through established routines.
	1.2	Established OHS risk control measures in preparation for the work are followed.
	1.3	Safety hazards not previously identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Advice is sought from the work supervisor or other appropriate person to ensure the work is coordinated effectively with others.
		1.6	Sources of materials that may be required for the work are established in accordance with established routines.
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Lay wiring/cabling and connect accessories for extra-low voltage circuits.	2.1	Established OHS risk control measures for carrying out the work are followed.
		2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.3	Wiring and accessories are installed to comply standards and job specifications with sufficient excess to affect terminations.
		2.4	Accessories are installed straight and square in the required locations and within acceptable tolerances.
		2.5	Cables and conductors are terminated at accessories in accordance with manufacture’s specifications and regulatory requirements.
		2.6	Cables installed for future service and marked in accordance with the cable identification scheme and terminated incompliance with regulatory requirements.
		2.7	Procedures for referring non-routine events to immediate supervisor for directions are followed.
		2.8	Cable installation and termination is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA
3 Complete and report work activities.	3.1 OHS work completion risk control measures and procedures are followed.
	3.2 Work site is cleaned and made safe in accordance with established procedures.
	3.3 Work supervisor is notified of the completion of the installation work in accordance with established routines.

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Required Skills and Knowledge

EQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and laying wiring/cabling and terminate accessories for extra-low voltage circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE108A Extra low voltage wiring

Evidence shall show an understanding of extra low voltage wiring cable protection and support method and accessories to an extent indicated by the following aspects:

T1 Cable protection and support method and accessories encompassing:

- Requirements to protect and support cables adequately - protection against mechanical damage, protection from adverse temperatures and corrosion and protection from magnetic field that may affect the performance of the cable.
- Cable support and protection devices, accessories and typical applications - metallic and non-metallic conduits, duct and trunking, cable ladder and tray, cable clips and ties and related accessories.
- Installation techniques - cable installation equipment and cable drawing and hauling techniques

T2 Types of cables used in the electrotechnology industry and their application encompassing:

- Structural components of cables and their purpose - conductors and conductor material; insulation; sheathings and servings.
- Application of various cables types
- Cable variates - single cables, flexible cables, flexible cords, shielded cables, armoured cables, ribbon cables, other similar and like cables
- Typical characteristics and use of power circuit cables and control circuit cables

T3 Installing cables in buildings, structures and premises encompassing:

- Building construction method and construction sequence.
- Typical cable routes through buildings, structures and premises.
- Building codes affecting the installation of cables in buildings, structures and premises - limitation on penetration structural elements and maintenance of fire protection interiority
- Cable segregation requirements

T4 Basic cable and conductor terminations encompassing:

- Insulation removal and replacement
- Conductor handling and cable terminations encompassing:
  - General aspects and soldering involving pins on electronic components and

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EQUIRED SKILLS AND KNOWLEDGE

stranded conductors carrying current up to 25 amperes.

- Application of connecting devices for conductors and terminals
- Continuity through connections and insulation resistance testing
- Stress release on cables/conductors.

T5 Technical standards, regulations and codes related to extra-low voltage work encompassing:

- Limitation imposed by regulations
- How to read and apply a standard
- Aspects of technical Standards that apply to extra-low voltage work

T6 Environmental and heritage regulation effecting electrotechnology work encompassing:

- Purpose of environmental and heritage regulation
- Typical issues affecting electrotechnology services and systems
- Meeting requirements

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside

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the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Lay wiring/cabling and terminate accessories for extra-low voltage in power and control circuits as described in 8) and including:

A	Understanding the nature of the work.
B	Selecting appropriate tools, cables and accessories.
C	Following appropriate cable routes.
D	Installing cable and accessories to requirements.
E	Terminating cables and accessories to manufacture's specifications and requirements.
F	Cleaning worksite.
G	Notifying completion of work using established procedures.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

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Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to laying wiring/cabling and terminate accessories for extra-low voltage circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to laying wiring/cabling and connecting accessories for extra-low voltage power and control cabling systems circuits using:

- At least one of the following wiring/cabling systems:
  - Unenclosed thermoplastic sheathed (TPS) cable
  - Enclosed thermoplastic insulated (TPI) or sheathed cables, and
- At least three of the following wiring/cabling systems:
  - single cable,
  - flexible cable,
  - flexible cord,
  - shielded cable,
  - ribbon cable,
  - other similar and like cable

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE110A Develop and implement energy sector maintenance programs

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the development of maintenance programs to ensure safe and continued operation of plant and equipment. It encompasses evaluating risks associated with equipment failure, development of failsafe strategies incorporating maintenance frequency, repair/overhaul/replacement policies, and development of record and reporting system.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher. It may be used in employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish maintenance requirements.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Policies and procedures are developed to include OHS practices, skills required and frequency and level of maintenance work.
	1.4	The extent of the maintenance program is determined from plant performance specifications and in consultation with relevant person(s).
	1.5	Appropriately competent persons are engaged to assess the risks associated with individual equipment failure.
	1.6	Level and frequency of repair/replace to be done under maintenance work is established from risk assessment reports and manufacture's recommendations and standards reflecting acceptable exposure to risk of equipment failure.
	1.7	Systems are established to manage and record maintenance work in accordance with organisation and regulatory requirements.
2 Develop and implement maintenance program.	2.1	Schedules are developed detailing maintenance levels and frequency for all equipment items based risk assessment reports and manufacture's recommendations.
	2.2	Procedures are developed and implemented to ensure the maintenance program is followed in accordance with the planned schedule and requirements.
	2.3	Procedures are developed and implemented to ensure records are maintained in accordance with planned schedule and requirements.
	2.4	Maintenance program is documented in accordance with in accordance with professional

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ELEMENT	PERFORMANCE CRITERIA	
		standards and organisation procedures.
3 Evaluate maintenance program.	3.1	Periodic and sample inspection reports are used to ascertain maintenance quality and the need for revision of maintenance schedule and frequency.
	3.2	Maintenance schedule is periodically reviewed and revised to maintain acceptable level of risk associated with equipment failure.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing and implementing maintenance programs.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE110A Scheduled maintenance processes

Evidence shall show an understanding of scheduled maintenance processors to an extent indicated by the following aspects:

T1 Maintenance principles encompassing:

- maintenance function
- role of maintenance department
- occupational health and safety requirements

T2 Maintenance systems encompassing:

- maintenance terminology
- preventative maintenance
- predictive maintenance
- corrective maintenance

T3 Data acquisition encompassing:

- plant history cards/files
- inspection techniques
- predictive maintenance
- remote visual inspection
- non-destructive testing
- thermography
- vibration analysis
- oil analysis

T4 Maintenance plan encompassing:

- characteristics of plant operation
- assessment of failure characteristics
- link failure characteristics to maintenance systems
- identify production windows
- resources
- labour
- materials
- establish plan

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REQUIRED SKILLS AND KNOWLEDGE

- implementation procedures

T5 Review of maintenance plan encompassing:

- analysis of records
- manual recording methods

T6 Computerised recording methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries

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risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop and implement maintenance programs as described in 8) and including:

A	Determining the extent of the maintenance program accurately.
B	Establishing the level and frequency of maintenance reflecting acceptable exposure to risk of equipment failure.
C	Developing an effective maintenance schedule implementation procedures.
D	Developing a maintenance record system.
E	Developing Ongoing maintenance evaluation scheme.
F	Documenting the maintenance program clearly.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

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These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing and implementing maintenance programs.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing and implement a maintenance program for a plant with at least 10 different types of items included in the schedule. Plant may be for production, process or building services.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE114A Supervise and coordinate energy sector work activities

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the supervising and coordinating of work activities the energy sector. It encompasses working safety, implementing safety procedures and processes, sequencing work activities, providing guidance and work instructions to others, ensuring job requirements are met and maintain necessary work documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to supervise and coordinate work activities	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Job specification and requirements are obtained and understood.
	1.3	Plant, materials and skills needed for the work are established from specifications and other relevant documentation.
	1.4	Plant, materials, personnel and others needed for the work are accessed in accordance with established procedures.
2 Supervise and coordinate work activities.	2.1	OHS policies, procedures and programs are implemented and monitored.
	2.2	Guidance and work instructions are given to appropriate personnel to ensure the various aspects of the work are sequenced and completed in accordance with job specifications and requirements.
	2.3	Cooperation is sought from others involved in the work to ensure the various aspects of the work are coordinated effectively.
	2.4	Work progress is monitored against schedules, job specifications and requirements.
	2.5	Conflict issues at the work site are dealt with in accordance with established procedures.
	2.6	Requested variations to job specification are dealt with in accordance with established procedures and processes.
	2.7	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Document supervision and coordination activities.	3.1	Job records are maintained in accordance with established procedures.
	3.2	Processes are followed to ensure activities are

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ELEMENT	PERFORMANCE CRITERIA
	carried out to established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and supervising and coordinating energy sector work activities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE114A Energy sector supervision fundamentals

Evidence shall show an understanding of energy sector supervision to an extent indicated by the following aspects:

T1 Importance of customer/client relations

T2 Interpersonal skills that enhance customer/client

T3 Dispute resolution

T4 Customer/client relations strategies

T5 Responsibilities of workplace supervisors

T6 Effective instruction methods

T7 Methods for seeking the cooperation of others

T8 Dealing with conflict

T9 Identify problems - Process and quality problems; Equipment selection, availability and failure; Teamwork and work allocation problems; Safety and emergency situations and incident; Performance gaps; Profit improvement and the like.

T10 Mathematical Tools - Average, Standard deviation and the like.

T11 Use of analytical techniques in problem solving - Brainstorming; Fishbone diagrams/cause and effect diagrams; Logic trees; Process logic/process requirements; Similarity/difference analysis; Pareto analysis; Force field/SWOT analysis.

T12 Using tools to assistance in problem solving - Procedures and work instructions; Safety data sheets; Job cards; Maintenance logs; Plant drawing.

T13 Determine corrective action encompassing:

- Tools
- Mode of communication procedure used within each enterprise
- Established work procedures and policies
- Size and structure of the teams/enterprise
- Group goals - team, section, enterprise
- Enterprise specific conflict resolution procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Action plans
- Priority requirements
- Measurable objectives
- Resource requirements
- Methods for reaching objectives
- Timelines
- Safety requirements
- Risk assessment
- Environmental requirements

T14 and Communicate recommendations - Feedback requirements; Corrective action analysis; Following up recommendations and the like.

T15 Implement Monitoring encompassing:

- Identifying components to be measured
- Measurement and monitoring techniques
- Measurement and monitoring tools

T16 Purpose of a quality system

T17 Procedures pertaining to the relevant work function

T18 Work instructions pertaining to the relevant work function

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Supervise and coordinate energy sector work activities as described in 8) and including:

A	Understanding job specification and requirements.
B	Accessing appropriate plant, materials and personnel.
C	Providing effective guidance and instructions to personnel.
D	Obtaining the cooperation of others.
E	Dealing with conflicts in accordance with established procedures.
F	Dealing with job variations in accordance with established procedures.
G	Ensuring work completion documentation is accurate and forwarded to appropriate persons.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with

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performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to supervising and coordinating energy sector work activities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to supervising and coordinating of work activities the energy sector with the following attributes:

- working safety
- implementing safety procedures and processes
- sequencing of work activities
- providing guidance and work instructions to others
- job requirements are met
- necessary work documentation maintained

Supervising and coordinating work activities shall be demonstrated in any of the following energy sector disciplines.

- Automation technologies
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE117A Implement and monitor energy sector OHS policies and procedures

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the mandatory requirements of persons in a supervisory role to implement and monitor an organisation's occupational health and safety policies, procedures and programs. It encompasses understanding an organisation's OHS obligations, providing safety information to staff, implementing and monitoring participative arrangements, safety procedures and training and maintaining safety records.

Application of the Unit

Application of the Unit

2)

This unit addresses information, processes and techniques for the application of general occupational health and safety requirements in workplaces and is essential for employees work supervisory responsibilities. The unit is based on Generic Competency A in the National Guidelines for Integrating OHS Competencies into National Industry Competency Standards [NOHSC: 7025 (1998) 2nd Edition].

Note:
All States/Territories and the Commonwealth have enacted legislation that establishes a general duty of care for workplace parties to ensure healthy and safe working conditions. In most workplaces, the final responsibility for providing a healthy and safe working environment, as far as practicable, rests with the employer. Employees also have a duty of care in relation to OHS that ensures their health and safety and that of others in the

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workplace. The relevant jurisdictional OHS legislation should always be consulted to ascertain the exact duties set down for employers and employees.

Licensing/Regulatory Information

License to practice **3)**

The competency described in this unit does not directly require a license to practice but is subject to regulations for occupational health and safe and contracts of training where they apply.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability

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Employability Skills	**5)** Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Provide OHS information to the work group.	1.1	Relevant provisions of occupational health and safety legislation and codes of practice are accurately and clearly explained to the work group.
	1.2	Information on the organisation's occupational health and safety policies, procedures and programs is provided in a readily accessible manner and is accurately and clearly explained to the work group.
	1.3.	Information about identified hazards and the outcomes of risk assessment and risk control procedures is regularly provided and is accurately and clearly explained to the work group.
2 Implement and monitor participative arrangements for the management of OHS.	2.1	Organisational procedures for consultation over occupational health and safety issues are implemented and monitored to ensure that all members of the work group have the opportunity to contribute.
	2.2	Issues raised through consultation are dealt with and resolved promptly or referred to the appropriate personnel for resolution in accordance with workplace procedures for issue

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ELEMENT	PERFORMANCE CRITERIA	
		resolution.
	2.3	The outcomes of consultation over occupational health and safety issues are made known to the work group promptly.
3. Implement and monitor the procedures for identifying hazards, assessing risk and controlling risks.	3.1	Existing and potential hazards in the work area are identified and reported so that risk assessment and risk control procedures can be applied.
	3.2	Work procedures to control risks are implemented and adherence to them by the work group is monitored in accordance with workplace procedures.
	3.3	Existing procedures to control risks are implemented and adherence to them by the work group is monitored in accordance with workplace procedures.
	3.4	Inadequacies in existing risk control measures are identified in accordance with the hierarchy of control and reported to designated personnel.
	3.5	Inadequacies in resource allocation for implementation of risk control measures identified and reported to designated personnel.
4 Implement the procedures for dealing with hazardous events.	4.1	Workplace procedures for dealing with hazardous events are implemented whenever necessary to ensure that prompt control action is taken.
	4.2	Hazardous events are investigated to identify their cause in accordance with investigation procedures.
	4.3	Control measures to prevent recurrence and minimise risks of hazardous events are implemented based on the hierarchy of control if within scope of responsibilities and competencies or alternatively referred to designated personnel for implementation.

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ELEMENT	PERFORMANCE CRITERIA
5 Implement and monitor the procedures for OHS training.	5.1 Occupational health and safety training needs are identified accurately, specifying gaps between occupational health and safety competencies required and those held by work group members.
	5.2 Arrangements are made for fulfilling identified occupational health and safety training needs in both on and off-the-job training programs in consultation with relevant parties.
6 Implement and monitor the procedures for maintaining OHS records.	6.1 Occupational health and safety records for work area are accurately and legibly completed in accordance with workplace requirements for occupational health and safety records and legal requirements for the maintenance of records of occupational injury and disease.
	6.2 Aggregate information from the area's occupational health and safety records is used to identify hazards and monitor risk control procedures within work according to organisational procedures and within scope of responsibilities and competencies.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and implementing and monitoring energy sector OHS policies and procedures

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE117A Energy sector Occupational Health and Safety, supervisory responsibilities

Evidence shall show an understanding of OHS enterprise responsibilities to an extent indicated by the following aspects:

T1 Provisions of relevant occupational health and safety legislation

T2 Principles and practice of effective occupational health and safety management

T3 Workplace hazards, range and selection of control measures

T4 Organisational health and safety management systems and policies and procedures needed for legislative compliance

T5 Impact of characteristics and composition of the workforce on occupational health and safety management

T6 Relevance of occupational health and safety management to other organisational management policies, procedures and systems.

T7 Analysis of entire work environment and judge occupational health and safety interventions

T8 Analysis of relevant workplace data

T9 Ability to assess resources needed for risk control.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Implement and monitor energy sector OHS policies and procedures as described in 8) and including:

A Providing OHS information to the work group.

B Implementing and monitoring participative arrangements for the management of OHS.

C Implementing and monitoring the procedures for identifying procedures for identifying hazards,

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	assessing risks and controlling risks.
D	Implementing the procedures for dealing with hazardous events.
E	Implementing and monitoring the procedures for OHS.
F	Implementing and monitoring the procedures for maintaining OHS records.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to implementing and monitoring energy sector OHS policies and procedures.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with other related units making up a qualification or possible skill clusters.

Components of this unit are included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to implementing and monitoring energy sector OHS policies and procedures with the following attributes:

- organisation's OHS obligations
- safety information to staff
- participative arrangements implementation and monitoring
- safety procedures
- training
- safety records maintained

Implementing and monitoring the mandatory requirements of persons in a supervisory role an organisation's occupational health and safety policies, procedures and programs shall be demonstrated in the following:

- Relevant Occupational Health and Safety legislation, regulations and codes of practice related to hazards present in the industry and particular workplace
- Implementation of OHS and the specific safety procedures and work instructions for particular workplace

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE118A Establish, maintain and evaluate energy sector OHS systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the mandatory responsibility of an organisation's executive officers to establish, maintain and evaluate an energy sector OHS system. It encompasses understanding an organisation's OHS obligations, establishing and maintaining, participative arrangements, procedures for hazard identification, risk assessment and control measures, procedures for dealing with hazardous incidents, safety training, safety records, and evaluating the safety system.

Application of the Unit

Application of the Unit

2)

This unit addresses information, processes and techniques for the application of general occupational health and safety requirements in workplaces and is essential for employees without managerial responsibilities. The unit is based on Generic Competency A in the National Guidelines for Integrating OHS Competencies into National Industry Competency Standards [NOHSC: 7025 (1998) 2nd Edition].

Note:

All States/Territories and the Commonwealth have enacted legislation that establishes a general duty of care for workplace parties to ensure healthy and safe working conditions. In most workplaces, the final responsibility for providing a healthy and safe working environment, as far as practicable, rests with the employer. Employees also have a duty of care in relation to OHS that ensures

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their health and safety and that of others in the workplace. The relevant jurisdictional OHS legislation should always be consulted to ascertain the exact duties set down for employers and employees.

Licensing/Regulatory Information

License to practice **3)**

The competency described in this unit does not directly require a license to practice but is subject to regulations for occupational health and safe and contracts of training where they apply.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of

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Employability Skills	**5)** competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish and maintain the framework for the OHS system.	1.1	Occupational health and safety policies are developed which clearly express the organisation's commitment with respect to occupational health and safety within the area of managerial responsibility and how relevant occupational health and safety legislation will be implemented, consistent with overall organisational policies.
	1.2	Occupational health and safety responsibilities and duties which will allow implementation and integration of the occupational health and safety system are clearly defined, allocated and included in job descriptions and duty statements for all relevant positions.
	1.3.	Financial and human resources for the operation of the occupational health and safety system are identified, sought and/or provided in a timely and consistent manner.
	1.4	Information on the occupational health and safety system and procedures for the area of managerial responsibility is provided and explained in a form which is readily accessible

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ELEMENT		PERFORMANCE CRITERIA	
			to employees.
2	Establish and maintain participative arrangements for management of OHS.	2.1	Appropriate consultative processes are established and maintained in consultation with employees and their representatives in accordance with relevant occupational health and safety legislation and consistent with the organisation's overall process for consultation.
		2.2	Issues raised through participation and consultation are dealt with and resolved promptly and effectively in accordance with procedures for issue resolution.
		2.3	Information about the outcomes of participation and consultation is provided in a manner accessible to employees.
3	Establish and maintain procedures for identifying hazards, assessing risk and controlling risk.	3.1	Existing and potential hazards within the area of managerial responsibility are correctly identified and identification confirmed in accordance with Occupational Health and Safety legislation, codes of practice and trends identified from the occupational health and safety records system.
		3.2	A procedure for ongoing identification of hazards is developed and integrated within systems of work and procedures.
		3.3	Activities are appropriately monitored to ensure that this procedure is adopted effectively throughout the area of managerial responsibility.
		3.4	Hazards identification is addressed at the planning, design and evaluation stages of any change in the workplace to ensure that new hazards are not created.
		3.5	Risks presented by identified hazards are correctly assessed in accordance with occupational health and safety legislation and coded of practice.
		3.6	A procedure for ongoing assessment of risk is developed and integrated within systems of work and procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	3.7	Activities are monitored to ensure that this procedure is adopted effectively throughout the area of managerial responsibility.
	3.8	Risk assessment is addressed at the planning, design and evaluation stages of any change within the area of managerial responsibility to ensure that the risk from hazards is not increased.
	3.9	Measures to control assessed risks are developed and implemented in accordance with the hierarchy of control, relevant occupational health and safety legislation, codes of practices and trends identified from the occupational health and safety records system.
	3.10	When measures which control a risk at its source are not immediately practicable, interim solutions are implemented until a control measure is developed.
	3.11	A procedure for ongoing control of risks, based on the hierarchy of control, is developed and integrated with general systems of work and procedures.
	3.12	Activities are monitored to ensure that the risk control procedure is adopted effectively throughout the area of managerial responsibility.
	3.13	Risk control is addressed at the planning, design and evaluation stages of any change within the area of managerial responsibility to ensure that adequate risk control measures are included.
	3.14	Inadequacies in existing risk control measures are identified in accordance with the hierarchy of control, and resources enabling implementation of new measures are sought and/or provided according to appropriate procedures.

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ELEMENT	PERFORMANCE CRITERIA	
4 Establish and maintain procedures for dealing with hazardous events.	4.1	Potential hazardous events are correctly identified.
	4.2	Procedures which would control the risks associated with hazardous events and meet any legislative requirements as a minimum are developed in consultation with appropriate emergency services.
	4.3	Appropriate information and training is provided to all employees to enable implementation of the correct procedures in all relevant circumstances.
5 Establish and maintain OHS training program.	5.1	An occupational health and safety training program is developed and implemented to identify and fulfil employees' occupational health and safety training needs as part of the organisation's general training program.
6 Establish and maintain a system for OHS records.	6.1	A system for keeping occupational health and safety records is established and monitored to allow identification of patterns of occupational injury and disease within the area of managerial responsibility.
7 Evaluate the OHS system and related policies, procedures and programs.	7.1	The effectiveness of the occupational health and safety system and related policies, procedures and programs is assessed according to the organisation's aims with respect to occupational health and safety.
	7.2	Improvements to the occupational health and safety system are developed and implemented to ensure more effective achievements of the organisation's aims with respect to occupational health and safety.
	7.3	Compliance with occupational health and safety legislation and codes of practice is assessed to ensure that legal occupational health and safety standards are maintained as a minimum.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and establishing, maintaining and evaluating energy sector OHS systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE118A Energy sector Occupational Health and Safety, enterprise responsibilities

Evidence shall show an understanding of OHS enterprise responsibilities to an extent indicated by the following aspects:

T1 Provisions of relevant health and safety legislation

T2 Principles and practice of effective occupational health and safety management

T3 Management arrangements relating to regulatory compliance

T4 Enterprise hazards and risks, control measures and relevant expertise required

T5 Characteristics and composition of workforce and their impact on occupational health and safety management

T6 Relevance of enterprise management systems to occupational health and safety management

T7 Analysis of working environment and design of appropriate occupational health and safety management systems

T8 Analysis of relevant data and evaluation of occupational health and safety system effectiveness

T9 Assess resources to establish and maintain occupational health and safety management systems.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Establish, maintain and evaluate energy sector OHS systems as described in 8) and including:

A Establishing and maintaining the framework for the OHS system.

B Establishing and maintaining participative arrangements for management of OHS.

C Establishing and maintaining procedures for

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identifying hazards, assessing risk and controlling risk.

D Establishing and maintaining procedures for dealing with hazardous events.

E Establishing and maintaining OHS training programs.

F Establish and maintain a system for OHS records.

G Evaluating the OHS system and related policies, procedures and programs.

H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Ability to implement these Occupational Health and Safety measures shall be demonstrated on all occasions safety issues arise.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to establishing, maintaining and evaluating OHS systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with other related units making up a qualification or possible skill clusters.

Components of this unit are included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to establishing, maintaining and evaluating energy sector OHS systems with the following attributes:

- organisation's OHS obligations
- participative arrangements establishment and maintained
- hazard identification procedures
- risk assessment and control measures
- hazardous incidents procedures for response
- safety training
- safety records
- safety system evaluation

Establishing, maintaining and evaluating OHS systems shall be demonstrated in the following:

- Relevant occupational health and safety legislation, regulations and codes of practice related to hazards present in the industry and particular workplace
- Establishing, maintaining and evaluating OHS system for the particular enterprise/organisation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE119A Solve problems in multiple path extra low voltage (ELV) a.c. circuits

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Correct title of pre-requisite to reflect unit title.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers determining correct operation of single source ELV a.c. parallel and series-parallel circuits and providing solutions as they apply to various electrotechnology work functions. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in multiple path circuits.

Application of the Unit

Application of the Unit

2)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

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This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V a.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on multiple path ELV a.c. electrical circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve multiple path ELV a.c. circuit problems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solve a.c. circuit problems from measure and calculated

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ELEMENT	PERFORMANCE CRITERIA	
		values as they apply to multiple path electrical circuit.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in multiple path ELV a.c. circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE119A Alternating current principles – single phase

Evidence shall show an understanding of alternating currents principles used in power circuits to an extent indicated by the following aspects:

T1 Sinusoidal alternating voltage and current encompassing:

- Generation of a sinusoidal voltage with a single turn coil rotated in a uniform magnetic field.
- the terms ‘period’, ‘maximum value’, ‘peak-to-peak value’, ‘instantaneous value’, ‘average value’, ‘root-mean-square (r.m.s.) value’, ‘crest factor’ and ‘form factor’ in relation to a sinusoidal waveform.
- the instantaneous value of induced voltage of a generated sinusoidal waveform.
- measurement of the instantaneous, peak, peak-to-peak values and the period of a sinusoidal waveform.
- the root-mean-square (r.m.s.) value and frequency of a sinusoidal waveform .
- phase relationship between two or more sinusoidal waveforms.

T2 Phasors encompassing:

- the terms ‘in-phase’, ‘out-of-phase’, ‘phase angle’, ‘lead’, and ‘lag’.
- the phase angle between two or more alternating quantities from a given sinusoidal waveform diagram.
- convention for representing voltage, current and the reference quantity in a phasor diagram.
- phasor diagrams two or more a.c. values of voltage and/or current.

T3 Resistance in a.c. circuits encompassing:

- connection of a single-source a.c. circuit to take resistance, voltage and current measurements.
- the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities.
- the relationship between voltage drops and current in a resistive a.c. circuit.

T4 Inductance in a.c. circuits encompassing:

- definition of ‘inductive reactance’.
- the inductive reactance of a given inductor and show the relationship between inductive reactance and frequency.

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REQUIRED SKILLS AND KNOWLEDGE

- equivalent inductive reactance in an a.c. circuit or any part of a circuit.
- application of Ohm's Law to determine voltage, current or inductive reactance in a purely inductive a.c. circuit given any two of these quantities.
- examples of inductive components in power circuits and systems and describe their effect on the phase relationship between voltage and current.
- the comparative current limiting characteristics of inductors and resistors.

T5 Capacitance in a.c. circuits encompassing:

- definition of 'capacitive reactance'.
- the capacitive reactance of a given capacitor and the relationship between capacitive reactance and frequency.
- equivalent capacitive reactance in an a.c. circuit or any part of a circuit.
- application of Ohm's Law to determine voltage, current or capacitive reactance in a purely capacitive a.c. circuit given any two of these quantities.
- examples of capacitive components in power circuits and systems and describe their effect on the phase relationship between voltage and current.

T6 Impedance encompassing:

- definition of 'impedance'.
- impedance of series, parallel and series-parallel circuits and diagrams showing the relationship between resistive, inductive and capacitive components (impedance triangle).
- connection of a single-source a.c. circuit and take resistance, voltage and current measurements.
- voltage, current or impedance values from measured or given values of any two of these quantities.
- phasor diagram usage to solve problems and show the relationship between voltages and currents in a.c. circuits.

T7 Resonance encompassing:

- conditions in a circuit that produce resonance.
- the relationship between resonance and frequency.
- the effect on the current of series resonance and parallel resonance conditions.
- applications where resonance is applied

T8 Power and power factor encompassing:

- difference between true power, apparent power and reactive power and the units.
- definition of the term "power factor".
- the effects of low power factor.
- local and AS/NZS 3000 requirements regarding the power factor of an installation and power factor improvement equipment.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in multiple path ELV a.c. circuits as described in 8) and including:

A Determining the operating parameters of an existing circuit.

B Altering an existing circuit to comply with specified operating parameters.

C Developing circuits to comply with a specified

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	function and operating parameters.
D	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in multiple path ELV a.c. circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE104A Solve problems in d.c. circuits

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- Single source parallel and series-parallel a.c. circuits as they apply to problems related to installation, fault finding, maintenance or development work functions in any of the following disciplines:
  - Computers
  - Data Communications
  - Electrical
  - Electronics
  - Fire protection
  - Instrumentation
  - Refrigeration and Air Conditioning
- In relation to at least two of the following types of circuit problems and on at least two occasions
  - determining the operating parameters of an existing circuit
  - altering an existing circuit to comply with specified operating parameters
  - developing circuits to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE121A Plan an integrated cabling installation system

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the planning of cable routes for intelligent power and lighting, information and communications, entertainment systems, distributed video and audio; energy management and control; security and safety; digital home health; age and assisted living;.. This unit encompasses determining immediate and future cabling needs of an installation and their origins and termination points, planning cable routes, specifying cable types, sizes, fixing/support methods and cable identification systems and documenting cabling plans based on calculated and/or deemed-to-comply solutions as well as the planning of the wiring hub if required.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

AND

UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

OR

UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 4 Writing 4 Numeracy 4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Determine immediate and future cabling needs.	1.1	OHS risk control measures and procedures for carrying out the work are followed.
	1.2	Work supervisor or customers are consulted to determine immediate and future services required.
	1.3	Immediate and future location of service items and accessories is determined and written confirmation sought from appropriate persons.
	1.4	Safety and other regulatory requirements to which the installation shall comply are obtained and understood.

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ELEMENT	PERFORMANCE CRITERIA	
2 Plan an integrate cabling system for immediate and future services	2.1	Types and sizes of cables required for the various services are chosen to comply with technical standards, coded and regulations.
	2.2	Cables are arranged into circuits to ensure safe and functional operation of the services for which they are intended and to comply with technical standards, coded, regulations and budgetary restraints.
	2.3	Cabling for protective and functional earthing arrangements is determined to comply with technical standards, coded and regulations.
	2.4	Cabling routes are planned and cable support and methods for protection against damage specified to ensure compliance with technical standards, coded and regulations.
	2.5	Cable identification scheme is development to aid installation of services.
	2.6	Methods of terminating cables intended for future services are specified to ensure compliance with technical standards, coded and regulations.
3 Document the integrated cabling plan	3.1	Types and sizes of cables chosen, together with supporting justification, are documented in accordance with established procedures.
	3.2	Cable routes and cable support and methods for protection against damage are documented in accordance with established procedures.
	3.3	Cable identification scheme and methods of terminating cables intended for future services are documented in accordance with established procedures.
	3.4	Acceptance of the integrated cabling plan is sought from appropriate persons.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning integrated cabling installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE121A Planning integrated cabling installations

Evidence shall show an understanding of integrated cabling systems to an extent indicated by the following aspects:

T1 Overview of relevant residential systems encompassing:

- information and communications
- entertainment
- energy management
- security and safety
- digital home health
- age and assisted living
- intelligent lighting and power

T2 Information and communications system encompassing:

- computing
- home video conferencing
- intercoms
- telephony

T3 Entertainment encompassing:

- distributed audio and video
- free-to-air TV and HDTV
- home theatre
- pay TV

T4 Energy management encompassing:

- controllable blinds
- controllable lighting and appliances
- electric vehicles
- manage energy use of key appliances

T5 Security and safety encompassing:

- automatic access control
- electronic monitoring
- fire safety

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REQUIRED SKILLS AND KNOWLEDGE

T6 Digital home health encompassing:

- monitoring devices
- video conferencing

T7 Age and assisted living encompassing:

- alert systems
- panic buttons
- intercom
- video cam

T8 Intelligent lighting and power encompassing:

- controlled heating and lighting
- power outlets
- lamps (fluoro and LED)
- smart appliances
- specialised sensors
- specialised telephony

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that,

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in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan integrated cabling installations as described in 8) and including:

A	Determining immediate and future cabling needs accurately.
B	Choosing appropriate type and size of cables for the immediate and future services.
C	Planning cable routes and specifying effective support and protection method.
D	Developing effective cable identification scheme.
E	Specifying compliant termination methods for cables intended for future use.
F	Documenting cabling plan including supporting justification.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to planning integrated cabling installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 1A Use computer applications relevant to a workplace

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to planning two integrated cabling installations for at least four of the following services.

- Intelligent electrical power and lighting
- Fixed home entertainment systems
- Integrated energy management system
- Security and safety system
- Climate control system
- Renewable energy systems
- Water management system
- information and communications
- digital home health
- age and assisted living

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE122A Carry out preparatory energy sector work activities

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the carrying out of preparatory work related to any energy sector work discipline. It encompasses working safely, following basic instructions under direct supervision. It will include energy sector support activities including the use of basic hand tools, the safe use of ladders and elevated work platforms and the fixing and securing of equipment under direction following routine work practices.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Plan to carry out basic energy sector support activities.	1.1	OHS procedures for a given work area are obtained and understood through established routines.
	1.2	Established OHS risk control measures in preparation for the work are followed.
	1.3	Safety hazards not previously identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	Basic work instructions are obtained. The nature and location of the work is obtained from the supervisor or other appropriate person to establish the scope of work to be undertaken.
	1.5	Basic work instructions are sought from the supervisor. Advice is sought from the supervisor

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ELEMENT	PERFORMANCE CRITERIA	
		or other appropriate person to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established routines.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Undertake energy sector support activities.	2.1	Established OHS risk control measures for carrying out the work are followed.
	2.2	Plant and equipment is checked in strict accordance OHS requirements and procedures.
	2.3	Mechanical equipment is installed straight and square in the required locations and within acceptable tolerances.
	2.4	Use of basic hand and power tools in accordance with safe working practices and OHS requirements.
	2.5	Basic work instructions are carried out under supervision.
	2.6	Procedures for referring non-routine events to immediate supervisor for directions are followed.
3 Complete work and tidy up.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Supervisor is notified of the completion of the work in accordance with established routines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out preparatory energy sector work activities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE122A Energy sector work activities support

Evidence shall show an understanding of energy sector work activities support to an extent indicated by the following aspects:

T1 Hand tools and their use encompassing:

- Hand tools for cutting, shaping, drilling, threading, tapping, and finishing metallic and non-metallic components encompassing:
  - types of tools and their purpose
  - techniques for the correct and safe use of these tools
  - hazards associated with their use
  - care and maintenance of hand tools
- Tools for measuring and marking out.
  - types of tools and their purpose
  - techniques for the correct and safe use of these tools
  - hazards associated with their use
  - care and maintenance of hand tools
- Tools for dismantling and assembling electrical and electronic components encompassing:
  - types of tools and their purpose
  - techniques for the correct and safe use of these tools
  - hazards associated with their use
  - care and maintenance of hand tools

T2 Fixed and portable tools and their use encompassing:

- Fixed power tools for cutting, shaping, drilling, and finishing metallic and non-metallic components encompassing:
  - types of tools and their purpose
  - techniques for the correct and safe use of these tools
  - hazards associated with their use
  - care and maintenance of fixed power tools
- Portable power tools for cutting, shaping, drilling, and structural components encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of fixed power tools
- requirements for use on construction sites.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to

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be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

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- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out preparatory energy sector work activities as described in 8) and including:

A	Routing, placing and securing cables to comply with requirements.
B	Placing and securing accessories accurately.
C	Maintaining fire integrity.
D	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out preparatory energy sector work

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activities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out preparatory energy sector work activities.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE123A Solve basic problems electronic and digital equipment and circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers determining correct operation of basic electronic and digital equipment and circuits, and providing solutions as they apply to various electronic and computer work functions. It encompasses working safely, problem solving procedures, including the use of basic measuring devices, providing solutions derived from equipment behaviour and measurements to predictable problems.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work electronic and digital equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve electronic and digital equipment problems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solve electronic and digital equipment problems from

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ELEMENT	PERFORMANCE CRITERIA	
		observation or equipment behaviour and measured values.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in electronic and digital equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE123A Basic electronic and digital principles

Evidence shall show an understanding of basic electronic and digital principles to an extent indicated by the following aspects:

T1 Fundamental concepts

- insulators and conductors
- basic electrical units and engineering prefixes
- voltage, current and resistance
- Ohm's Law
- electrical power
- digital and analogue multimeters

T2 Alternating Currents and Waveforms

- waveforms (sine and square wave)
- the AC mains supply
- electrical safety
- fuses
- lamps and indicators

T3 Electromagnetic Waves and Signals

- electromagnetic waves
- the Radio Frequency spectrum
- wave propagation
- signals and bandwidth
- transmission lines and antennas
- harmonics

T4 Capacitance and inductance

- inductors and capacitors

T5 Electromagnetic Interference

- electrical noise
- induced currents and voltages
- cross-talk
- electromagnetic Interference

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REQUIRED SKILLS AND KNOWLEDGE

T6 Batteries

- types of battery
- battery capacity
- care of batteries

T7 Techniques in the use of analogue and digital multimeters - broad overview of electronics theory applicable to commonplace electronic and computer equipment servicing and support tasks, and includes general appreciation of the topics and concepts rather than rigorous theoretical calculations and designs

T8 Analogue versus digital

- digital waveforms

T9 Number systems

- binary
- hexadecimal
- binary addition and subtraction
- number system conversions

T10 Codes

- ASCII
- ANSI
- error detecting codes
- - parity
- - check sums
- - CRC
- error correction

T11 Basic logic

- AND, OR, NOT, XOR
- truth tables

T12 Data manipulation

- clocks and data rates
- basic storage cell
- registers
- ripple counter (binary counting)
- shift register (serial to parallel conversion)
- multiplexer and de-multiplexer
- bus architecture
- - encoding / decoding
- - addressing methods

T13 Analogue to digital conversion

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REQUIRED SKILLS AND KNOWLEDGE

T14 Digital to analogue conversion - broad overview of digital electronics theory applicable to everyday computer servicing and support tasks and encompasses topics and concepts and is not for in depth theoretical calculations and designs. Also there are no specific logic gates or logic levels involved.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

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Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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- Solving problems in electronic and digital equipment as described in 8) and including:

A	Using methodical problem solving methods.
B	Taking and recording measurements correctly and accurately using relevant measuring equipment.
C	Deducing equipment behaviour correctly and accurately.
D	Providing written justification for the solutions to problems.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving basic problems electronic and digital equipment.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- Electronic and digital equipment problems as they apply to setting-up, fault finding, maintenance or development work functions in any of the following disciplines:
  - Computers
  - Data Communications
  - Electronics, and
- In relation to the following types of electronic and digital equipment problems
  - Determining the operating parameters of existing operating equipment
  - Altering existing equipment to comply with specified operating parameters.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE124A Compile and produce an energy sector detailed report

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers complying and producing an energy sector report. It encompasses determining the safety requirements are met and all regulatory responsibilities are adhered to. The person competent in this unit must demonstrate an ability to identify information sources and collect and analyse and format information applicable to the electrotechnology industry and produce a report as required.

Application of the Unit

Application of the Unit

2)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

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Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop a energy sector report.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for report writing are reviewed are adopted in accordance with

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ELEMENT		PERFORMANCE CRITERIA	
			organisation policies.
		1.3	The scope of the report is evaluated and report parameters established using a formal evaluation/survey processes.
		1.4	Criteria from other related works impacting on the report are determined from other sources.
		1.5	Identify source and availability of information.
2	Develop energy sector report.	2.1	Report is developed to include scenarios/requirements established in consultation with appropriate person(s), and regulatory requirements.
		2.2	Report is developed in collaboration with all relevant personnel.
		2.3	Competent persons are identified to assist in the compilation of the report.
		2.4	Report is reviewed against all inputs and adjusted to rectify any anomalies.
		2.5	Compile report in accordance with organisation policies and procedures.
		2.6	Compile and analyse research report information
3	Obtain approval for final energy sector report.	3.1	Report is presented and discussed with person(s) of higher authority.
		3.2	Alterations to the report resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
		3.3	Final report is presented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and compiling and producing an electrotechnology report.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE124A Energy sector detailed report writing

Evidence shall show an understanding of analysis, decision making and reporting as they apply to engineering work functions to an extent indicated by the following aspects:

T1 Communicating with personnel encompassing:

- Oral communications
- Written procedures and work instructions

T2 Communicating with suppliers

T3 Communicating with customers

T4 Purpose and extent of maintaining work activities records in an enterprise encompassing:

- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements
- Using basic computer functions encompassing:
- Starting up
- Selecting application
- Entering information
- Saving
- Printing

T5 Techniques of analysis encompassing:

- use of appropriate sampling techniques to collect data.
- types of data and classification.
- effective questionnaire design
- data collection errors.
- frequency tables.
- statistical diagrams – drawing and interpretation.
- the general shape of a frequency distribution.
- different types of diagrams.
- mean time between failures calculations

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REQUIRED SKILLS AND KNOWLEDGE

T6 Summary of statistics encompassing:

- measures of central tendency
- measures of dispersion
- a 5-point summary for a given data set, box and whisker plot distribution
- data sets comparison using measures of centre and spread
- the effect of outliers on measures of centre and spread
- use computer programs or calculators to simplify calculations

T7 Correlation and regression encompassing:

- bivariate data and scatter diagrams.
- product-moment correlation coefficient calculation and interpretation.
- difference between causation and correlation.
- equations of regression lines from bivariate data with a calculator and line plotting on a scatter diagram.
- using the equation of regression to make predictions in practical situations.
- investigation of practical problems using correlation and regression.

T8 Investigation and reporting encompassing:

- presentation of a well formatted report with a clearly stated aim.
- using the internet to obtain relevant data.
- description of the statistical method and design chosen to meet the aim of the investigation.
- statistical analysis and results reporting.
- evaluation and interpretation of the results of the investigation.
- discussion of the investigation with reference to real world applications.
- chronology of the investigation.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Compile and produce an energy sector report as described in 8) and including:

A Typical organisation policies and procedures.

B Access to a report brief to established report parameters.

C Access to appropriate person(s) to establish report requirements.

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D	Establishing the scope and parameters of the report.
E	Determining the impact of other related works.
F	Developing design brief incorporating scenarios and all requirements.
G	Appropriate computer application.
H	Identifying competencies required for the report.
I	Documenting report proposal.
J	Negotiating alterations to the proposed report successfully.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to compiling and producing an energy sector report.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit of competency describes work conducted by technical personnel who contribute to the conduct of energy sector report writing.

This unit of competency is typically performed by high-level technicians, working as part of a product/application/service research and/or design, development and implementation team. This generally involves working closely with a range of management and production/operations personnel and requires balancing the business and technical sides of the research process.

At this level, personnel should be able to interpret and explain sections/types of legislation, codes, regulations, Australian Standards and Intellectual Property rights that apply to the subject matter being reported upon. This unit of competency should be demonstrated in accordance with the organisations

- Occupational Health and Safety and Workplace Safety policies and procedures
- Goals, values, objectives, plans, systems and processes
- Business and performance plans
- Ethical standards
- Client service standards
- Quality and continuous improvement processes and standards
- Standard Operating Procedures
- Resources
- Technical standards
- Regulatory requirements

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE125A Provide engineering solutions for problems in complex multiple path circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers determining correct operation of complex multiple path circuits and providing engineering solutions as they apply to various branches of electrotechnology work functions. It encompasses working safely, problem solving procedures, including using electrical measuring devices, applying appropriate circuit theorems and providing solutions derived from measurements and calculations and justification for such solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE126A	Provide solutions to basic engineering computational problems

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to solve problems in complex multiple path circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct

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ELEMENT	PERFORMANCE CRITERIA	
		operation and safety.
2 Solve problems in complex multiple path circuits	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solve circuit problems from measure and calculated values as they apply to complex multiple path circuit.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and provide engineering solutions for solving problems in complex multiple path circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE125A Circuit analysis

Evidence shall show an understanding of circuit analysis to an extent indicated by the following aspects:

T1 Voltage/Current Sources and Kirchhoff's Law for d.c. Linear Circuits encompassing:

- calculating the effect of the internal resistance on terminal voltage and current delivered for practical voltage sources and current sources
- calculating current and voltage in any d.c. network of up to two loops and three sources.
- Kirchhoff's Law using a circuit simulation program.
- function and operation of an electronics circuit simulation program.
- using electronics circuit simulation program.

T2 Superposition Principles for d.c. Linear Circuits encompassing:

- d.c. networks (two loops, three sources)
- using simulation programs
- calculating current and voltage in any d.c. network of up to two loops and three sources.
- Superposition theorem using a circuit simulation program.

T3 Mesh and Nodal Analysis for d.c. Linear Circuits encompassing:

- writing mesh equations for d.c. networks containing up to three loops.
- writing Nodal equations for d.c. networks containing up to three nodes.
- using mesh analysis to find currents in d.c. networks of up to two loops.
- using nodal analysis to find node voltage and branch currents in d.c. networks of up to two nodes
- using a circuit simulation program to confirm the results of Mesh analysis or Nodal analysis of d.c. networks.

T4 Thévenin's principles for d.c. Linear Circuits encompassing:

- calculating the effect of the internal resistance on terminal voltage and current delivered for practical voltage sources and current sources.
- calculating the Thévenin equivalent voltage and resistance for d.c. networks and determining the load current, voltage and power.

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REQUIRED SKILLS AND KNOWLEDGE

- converting the Thévenin equivalent circuit to a Norton equivalent circuit and vice versa.
- verifying the equivalence of Thévenin equivalent circuits by measurement.

T5 Norton's principles for d.c. linear circuits encompassing:

- calculating the effect of the internal resistance on terminal voltage and current delivered for practical voltage sources and current sources.
- calculating the Norton equivalent current and resistance for d.c. networks and determining the load current, voltage and power.
- converting the Thévenin equivalent circuit to a Norton equivalent circuit and vice versa.
- verifying the equivalence of Norton equivalent circuits by measurement.

T6 Phasors encompassing:

- time domain and frequency domain
- frequency, angular frequency and units of measurement
- defining rms and convert between time domain and rms phasor values for a sine wave.
- converting between angular frequency and frequency.
- using a calculator to convert between polar and rectangular forms of phasor.
- representing a.c. voltages on a phasor diagram.

T7 Complex Impedance encompassing:

- defining impedance, resistance and reactance.
- defining admittance, conductance and susceptance.
- converting between conductance to resistance.
- converting between susceptance and reactance.
- converting between impedance and admittance.
- sketching impedance and admittance diagrams.
- calculating two-component series equivalent circuits and two-component parallel equivalent circuits and convert between these forms.

T8 Series and parallel a.c. linear circuits encompassing:

- Kirchhoff's Laws
- series equivalent impedance
- parallel equivalent impedance
- voltage divider and current divider rules
- calculating and measuring voltage and currents in a series a.c .circuit and draw the phasor diagram.
- calculating and measuring currents in a parallel a.c. circuit and draw the phasor diagram.
- calculating and measuring voltage and currents in a series/parallel a.c. circuit and draw the phasor diagram.

T9 Superposition principles and Kirchoff's Laws applied to a.c. linear circuits encompassing:

- calculating current and voltage in any a.c. network of up to two loops and two sources.
- using circuit simulation programs to demonstrate the superposition theorem.

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REQUIRED SKILLS AND KNOWLEDGE

- function and operation of an electronics circuit simulation program.
- entering given circuit specifications into an electronic circuit program.
- setting the circuit simulation program operation parameters including input and output values, ranges and graduation.
- producing hardcopies of the circuit and analyse results.

T10 Mesh and Nodal analysis for a.c. linear circuits encompassing:

- Mesh analysis
- Node voltages and nodal analysis
- matrix representation
- method of determinants
- writing mesh equations for a.c. networks containing up to three loops.
- writing nodal equations for a.c. networks containing up to three nodes.
- using mesh analysis to find currents in a.c. networks of up to two loops.
- using nodal analysis to find node voltage and branch currents in a.c. networks of up to two nodes.
- using a circuit simulation program to confirm the results of mesh analysis or nodal analysis of a.c. networks.

T11 Thévenin and Norton theorems applied to a.c. linear circuits encompassing:

- calculating the effect of the internal resistance on terminal voltage and current delivered for practical voltage sources and current sources.
- calculating the Thévenin equivalent voltage and impedance for a.c. networks and determining the load current, voltage and power.
- calculating the Norton equivalent current and impedance for a.c. networks and determining the load current, voltage and power.
- converting the Thévenin equivalent circuit to a Norton equivalent circuit and vice versa.
- verifying the equivalence of Thévenin and Norton equivalent circuits by measurement.

T12 Star-delta conversions encompassing:

- Star connections
- Star-delta transformation formula equations
- selection of appropriate conversion
- calculating the delta connected equivalent of a star connected balanced a.c. or d.c. load and vice versa.
- converting a complex non-series/parallel network to a series/parallel network by means of star-delta or delta-star conversions.
- verifying star-delta and delta-star network conversions by measurements.

T13 Complex a.c. power and maximum power transfer theorem encompassing:

- true power, reactive power and apparent power
- maximum power transfer
- calculating real, reactive and apparent power for series/parallel a.c. circuits and state the

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REQUIRED SKILLS AND KNOWLEDGE

appropriate units of measurement.

- calculating the power factor of a.c. series/parallel circuits.
- drawing power triangle for a given circuit.
- calculating the load value which would consume maximum power and calculate this power for d.c. networks.
- calculating the load value which would consume maximum power in an a.c. network when the load is a pure resistance and calculate the power.
- calculating the load value which would consume maximum power in an a.c. network when the load is an impedance of variable resistance and reactance and calculate the power.
- verifying load selection by measurement.

T14 Transients encompassing:

- transients in R-C and R-L circuits
- growth and decay
- calculating voltage and currents in R-C series circuits using exponential equations.
- calculating voltage and currents in R-L series circuits using exponential equations

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and

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EVIDENCE GUIDE

regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in complex multiple path circuits as described in 8) and including:

    A Determining the operating parameters of existing circuit.

    B Using established problem solving methods.

    C Taking relevant measurements accurately.

    D Interpreting measured values appropriately.

    E Providing effective solutions to circuit problems from measurements and calculations.

    F Giving written justification of solutions provided.

    G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in complex multiple path circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- Complex series-parallel circuits as they apply to problems related to engineering diagnosis and development work functions in any of the following disciplines:
  - Computers
  - Data Communications
  - Electrical
  - Electronics
  - Instrumentation
  - Refrigeration and Air Conditioning
- In relation to the following types of circuit problems and on at least two occasions:
  - Determining the operating parameters of an existing circuit
  - Altering an existing circuit to comply with specified operating parameters
  - Developing circuits to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Electrotechnology

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UEENEEE126A Provide solutions to basic engineering computational problems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the application of computational processes to solve engineering problems. It encompasses working safely, applying problem solving techniques, using a range of mathematical processes, providing solutions to electrical/electronics engineering problems and justifying such solutions.

Note.
Typical engineering problems are those encountered in meeting requirements in a design brief, meeting performance requirements and compliance standards, revising systems operating parameters and dealing with system malfunctions

Application of the Unit

Application of the Unit **4**)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE029B Solve electrotechnical problems

or

UEENEEG102A Solve problems in low voltage a.c. circuits

or

UEENEEH014B Troubleshoot frequency dependent circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Provide computational solutions to engineering problems.	1.1	OHS procedures for a given work area are obtained and understood
	1.2	The nature of the problems are obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.3	Problems are clearly stated in writing and/or diagrammatic form to ensure they are understood and appropriate methods used to resolve them.
	1.4	Known constants and variable related to the problem are obtained from measured values or problem documentation.
	1.5	Alternative methods for resolving the problem are considered and where necessary discussed with appropriate person(s).

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Problems are solved using appropriate mathematical processes and within the realistic accuracy.
2 Complete work and document problem solving activities	2.1	Justification for solutions used to solve engineering problems is documented for inclusion in work/project development records in accordance with professional standards.
	2.2	Work completion is documented and appropriate person(s) notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing computational solutions to basic engineering problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE126A Electrotechnology engineering maths

Evidence shall show an understanding of electrotechnology engineering maths to an extent indicated by the following aspects:

T1 Rational, irrational numbers and basic algebra

- simplification of expressions involving square roots and cube roots
- scientific and engineering notation
- evaluation of expressions using a calculator
- convert units of physical quantities using unity brackets
- substitute given values into formulae to find physical quantities
- manipulate algebraic expressions using mathematical operations in their correct order, the laws of indices, expansion of brackets and collecting like terms

T2 Algebraic manipulation

- Factorise algebraic expressions using common factors
- Factorise quadratic expressions using trial and error on the factors of the coefficients
- Simplify algebraic fractions using common denominators and cancelling
- Solve simple one variable equations including algebraic fractions
- Find the quotient and remainder given a linear divisor.
- Transpose formulae to find a required variable.

T3 Laws of indices

- Conversion between decimal notation, scientific notation and engineering notation
- Laws of indices: positive /negative values, multiplication/division, fractional values, index equals zero
- Logarithmic laws: multiply/divide
- solution of exponential equations using logarithms, substitution and solution of relevant formulae involving exponents or logarithms
- Graphs of exponential functions, 10x and ex and the inverses log10(x) and loge(x) functions on log-linear graphs
- Convert numbers into scientific and engineering notation using the laws of indices
- Manipulate and simplify arithmetic and algebraic expressions using the laws of indices

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REQUIRED SKILLS AND KNOWLEDGE

and logarithms

- Express logarithms as indices.
- Perform logarithmic operations.
- Determine logarithms and antilogarithms to base 10, using a scientific calculator.
- Determine logarithms and antilogarithms to base e, using a scientific calculator.
- Convert logarithmic values from base 10 to base e and vice versa.
- Sketch given functions on log-linear graphs

T4 Estimations, errors and approximations

- Errors in measurement
- Maximum probable error
- Show awareness of errors in measurement and of giving results in appropriate number of significant figures
- Use estimations and approximations to check the reasonableness of results.

T5 Plane figures – triangles and basic trigonometry

- Angles in a triangle
- Isosceles and equilateral triangles
- Congruent triangles
- Similar triangles
- Pythagoras' theorem
- Area of triangles
- Basic trigonometry functions
- Degrees, radians
- The ratios: sin, cos, tan, cosec, sec, cot.
- Inverse trig functions
- Sine and cosine rules

T6 Plane figures - quadrilaterals and circles

- Types and properties of quadrilaterals
- Areas and perimeters of regular quadrilaterals
- Lengths of arcs
- Angles in a circle - degrees
- Angles in a circle - radians
- Lengths of chord segments
- Tangents to circles
- Circumference and area of circles
- Names and characteristics of common polygons

T7 Graphs of Trigonometric functions

- Graph trigonometric functions and solve trigonometric equations.
- Simplify trigonometric expressions using trigonometric identities

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REQUIRED SKILLS AND KNOWLEDGE

- Convert angular measure in degrees to radians and vice versa
- Graph trigonometric functions including graphs of y = sin x and y = cos x
- Using vocational applications of current or voltage as a function of time, consider changes in amplitude, consider changes in frequency.
- Examine relationships of frequency, period and angular velocity.
- Sketch graphs of the form f(t) = a sin φt and f(t) = a cos φt, where a is the peak voltage or current, and φ is the angular velocity
- Solve graphically equations of the form f(t) = a sin φt and f(t) = a cos φt
- Show a positive or negative angle on the unit circle.
- Use symmetry properties to find trigonometric ratios for angles greater than π/2.
- Solve simple vocational problems relating period, frequency and angular velocity.

T8 Graphs of linear functions

- The number plane
- Gradient and x and y intercepts of a straight line
- Equation of a straight line length and mid-point of a straight line segment
- Function notation

T9 Simultaneous equations

- Graphical solutions
- Substitution
- Elimination
- Solve 2 linear simultaneous equations both algebraically and graphically.

T10 Matrices

- Perform the basic operations on matrices up to 3 x 3
- Manipulate matrix equations and expressions
- Recognise inverse and identity matrices up to 3 x 3 and use to solve systems of linear equations.
- Find determinants up to 3 x 3 and use to solve systems of linear equations.
- Solve problems involving more than two simultaneous equations.
- State the limitations of graphical methods of solution.
- Distinguish between a matrix and an array.
- Describe the null, diagonal and unit matrix
- Describe and identify a singular/non-singular matrix

T11 Quadratic functions

- Graphs of quadratic functions represented by parabolas and the significance of the leading coefficient.
- Graph quadratic functions and solve quadratic equations.
- Sketch and interpret the graphs of quadratic functions showing the significance of the leading coefficient and the zeros
- Solve quadratic equations by factoring or using quadratic formula

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REQUIRED SKILLS AND KNOWLEDGE

- Solve simultaneously linear and quadratic equations algebraically and geometrically
- Interpret verbally formulated problems involving quadratic and linear equations and solve.

T12 Exponential and logarithmic functions

- Transform non-linear functions (including exponential) to linear forms and plot data.
- Draw curves of best fit, interpolate data and estimate constants in suggested relationships.
- Interpret verbally formulated problems involving growth and decay, and solve.
- Graph exponential and logarithmic functions and solve exponential and logarithmic equations.
- Sketch the graphs of simple exponential and logarithmic functions showing behaviour for large and small values

T13 Vectors and Phasors

- The vector as an expression of magnitude and direction
- The vector sum of x and y values in terms of magnitude and direction
- Rectangular components of vectors in the form $x = r \cos \theta$ and $y = r \sin \theta$
- Rectangular-polar and polar-rectangular conversion
- Vector addition and subtraction
- Express rectangular components of vectors in the form $x = r \cos \theta$ and $y = r \sin \theta$

T14 Complex numbers

- Definitions and notation of complex numbers
- Complex numbers as vectors on an Argand diagram
- laws of complex numbers and apply the laws in suitable calculations.
- Plot complex numbers on the Argand plane.
- Express vectors as complex numbers and perform suitable calculations.
- Calculate the conjugate of a complex number.
- Using a calculator for rectangular-polar and polar-rectangular conversions.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

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EVIDENCE GUIDE

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide computational solutions to basic engineering problems as described in 8) and including:

    A Clearly stating problems in written and diagrammatic form.

    B Obtaining known constants and variable from an appropriate source.

    C Solving problems using appropriate mathematical processes.

    D Documenting justification of solutions provided in accordance with professional standards.

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing computational solutions to basic engineering problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to problems that apply to engineering diagnosis development and work functions with the following attributes:

- working safety
- problem solving techniques application
- range of mathematical processes used
- provision electrical/electronics engineering problems solutions
- such solutions justification

Providing computational solutions to basic engineering problems shall be demonstrated in any of the following disciplines:

- Computers
- Data Communications
- Electrical
- Electronics
- Instrumentation
- Refrigeration and Air Conditioning

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Electrotechnology

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UEENEEE127A Use advanced computational processes to provide solutions to energy sector engineering problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the application of advanced computational processes to solve energy sector engineering problems. It encompasses working safely, applying problem solving techniques, using a range of advanced mathematical processes, providing solutions to electrical/electronics engineering problems and justifying such solutions.

Note.
Typical engineering problems are those encountered in meeting requirements in a design brief, meeting performance requirements and compliance standards, revising systems operating parameters and dealing with system malfunctions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 6.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not

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License to practice **3)**

require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.
Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Unit Code	Unit Title
Common Unit Group	
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE126A	Provide solutions to basic engineering computational problems
UEENEEE129A	Solve electrotechnical engineering problems
Electrotechnology Unit Pathway	
UEENEEH169A	Solve problems in basic electronic circuits
Electronics and Communications Unit Pathway	
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
Electrical Unit Pathway	
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and

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Prerequisite Unit(s) **4)**

related circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading 5	Writing 5	Numeracy 5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Provide computational solutions to energy sector engineering	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	The nature of the problems are obtained from documentation or work supervisor to establish

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ELEMENT		PERFORMANCE CRITERIA	
	problems		the scope of work to be undertaken.
		1.3	Problems are clearly stated in writing and/or diagrammatic form to ensure they are understood and appropriate methods used to resolve them.
		1.4	Known constants and variable related to the problem are obtained from measured values or problem documentation.
		1.5	Alternative methods for resolving the problem are considered and where necessary discussed with appropriate person(s).
		1.6	Problems are solved using advanced mathematical processes and within the realistic accuracy.
2	Complete work and document problem solving activities.	2.1	Justification for solutions used to solve engineering problems is documented for inclusion in work/project development records in accordance with professional standards.
		2.2	Work completion is documented and appropriate person(s) notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and using advanced computational processes to provide solutions to energy sector engineering problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE127A Advanced Engineering Maths

Evidence shall show an understanding of advanced engineering maths to an extent indicated by the following aspects:

T1 Differential Calculus encompassing:

- basic concepts of differential calculus, limited to definition of the derivative of a function as the slope of a tangent line (the gradient of a curve); limits; basic examples from 1st principles; Notation and Results of derivative of k.f(ax + b) where f(x)=x to the power of n, sin x, cos x, tan x, e to the power of x, ln x.
- rules - derivative of sum and difference; product rule; quotient rule; chain rule (function of a function), limited to two rules for any given function, the 2nd derivative.
- applications - equations of tangents and normals; stationary points; turning points; and curve sketching; rates of change; rectilinear motion
- verbally formulated problems involving related rates and maxima: minima

T2 Integral Calculus encompassing:

- integration as the inverse operation to differentiation - results of the integral of k.f(ax + b) where f(x) = x to the power of n, sin x, cos x, sec squared x, e to the power of x, method of substitution, the definite integral.
- applications - areas between curves; rectilinear motion including displacement from acceleration and distance travelled; voltage and current relationship in capacitors and inductors and the like.

T3 Linear Algebra encompassing:

- matrices and inverse matrices;
- linear mapping,
- determinants,
- solution of linear equations.

T4 Vectors encompassing:

- geometrical representation,
- addition and scalar multiplication,
- dot and cross products,
- equations of lines and planes.

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REQUIRED SKILLS AND KNOWLEDGE

T5 Variables encompassing:

- graphs, level curves and surfaces
- partial derivatives; chain rule; directional derivative;
- maxima and minima.

T6 Sequences and Series encompassing:

- algebraic and Fourier series, convergence; Taylor's Theorem
- power series manipulation.

T7 Differential Equations encompassing:

- first order and separable linear equations
- second order linear equations.
- partial differential equations.
- numerical Techniques.

T8 Number encompassing:

- integer, irrational and complex numbers.
- number systems.
- arithmetic operations.
- accuracy and stability.

T9 Statistics encompassing:

- assembly, representation and analysis of data.
- fitting distributions to data.
- non-parametric statistics.
- tests of significance for means, variances and extreme values.
- correlation

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use advanced computational processes to provide solutions to energy sector engineering problems as described in 8) and including:

A	Clearly stating problems in written and diagrammatic form.
B	Obtaining known constants and variable from an appropriate source.

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C	Solving problems using appropriate advanced mathematical processes.
D	Documenting justification of solutions provided in accordance with professional standards.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above in Context of and specific resources for assessment, evidence should show demonstrated competency in using advanced computational processes to provide solutions to engineering problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires

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that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to complex problems that apply to energy sector engineering diagnosis development and work functions with the following attributes:

- working safety
- problem solving techniques application
- range of advanced mathematical processes used
- provision electrical/electronics engineering problems solutions
- such solutions justification

Providing using advanced computational processes to provide solutions to energy sector engineering problems shall be demonstrated in any of the following disciplines:

- Computers
- Data Communications
- Electrical
- Electronics
- Instrumentation
- Refrigeration and Air Conditioning

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE128A Develop engineering solutions to photonic system problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers developing engineering solutions to resolve problems with photonic systems. It encompasses working safely; apply extensive knowledge of photonic technologies and their application, gathering and analysing data, and applying problem solving techniques, developing and documenting solutions and alternatives.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems

AND

UEENEEE129A	Solve electrotechnical engineering problems

OR

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits

OR

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

AND

UEENEEE104A	Solve problems in d.c. circuits

OR

UEENEEH1	Solve problems in basic electronic circuits

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Prerequisite Unit(s) **4)**

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop engineering solution for photonic systems problems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the photonic systems problem is determined from performance specifications and situation reports and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Strategies are identified to ensure efficient development and implementation of solution(s).
2 Develop engineering solutions for photonic system problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of photonic technology, operation, device characteristics and applications are applied to developing solutions to photonic system problems.
	2.3	Parameters, specifications and performance requirements in relation to each photonic system problem are obtained in accordance with established procedures.
	2.4	Approaches to resolving photonic system problems are analysed to provide most effective solutions.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

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ELEMENT	PERFORMANCE CRITERIA
3 Test, document and implement engineering solution for photonic problems.	3.1 Solutions to photonic problems are tested to determine their effectiveness and modified where necessary. 3.2 Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed. 3.3 Appropriately competent and qualified person(s) required to implement solutions to photonic system problems are coordinated in accordance with regulatory requirements and enterprise policy. (See Note) 3.4 Justification for solutions used to solve photonic systems is documented for inclusion in work/project development records in accordance with professional standards. Note: A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing engineering solutions to photonic problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE128A Photonic principles and applications

Evidence shall show an understanding of photonic principles and applications to an extent indicated by the following aspects:

T1 Photonic principles

- Measurements on the optical devices that are used in a basic fibre optic link
- Optical devices making up an optical fibre link
- The interconnection of optical devices that make up a one way optical fibre link
- The construction of an LED optical light source
- The electrical and optical parameters of LASERs
- LED and LASER light sources
- PN photodiodes and phototransistors
- The electrical and optical parameter
- The basic capability of optical technology involving energy transfer, communications, sensing, miniaturisation and signal processing

T2 The environmental advantages and impacts of optical technology

- The nature and importance of innovation
- The triple bottom line of business: economic, social and environmental as it relates to optical technology
- Scenario development using a variety of expressive methods to explore alternatives.
- Information networking
- Medical applications.
- Teleworking applications.
- Education applications
- Opportunities in the optical industry in Australia
- Innovations in business using optical technology
- Innovations in the provision of infrastructure in Australia

T3 Basic geometric optics

T4 Introduction to photonic components

T5 The basic concepts of optical transmission encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- 'Atmospheric' and 'guided' optical transmission systems
- Fibre 'guided' systems compared to 'atmospheric' systems

T6 Photonic components and component technologies encompassing:

- Differentiate between 'passive' and 'active' photonic components
- Identify and describe optical component technologies

T7 Photonic components and their roles in photonic devices encompassing:

- Operational concepts of components and devices,
- Active verses passive devices
- Available photonic devices and their constituent components
- Photonic device operation

T8 Operating principles of optical couplers and their characteristics encompassing:

- Optical couplers.
- Loss
- Number of ports
- Directionality
- Wavelength selectivity
- 'T' and 'Y' couplers
- '1-to-N' or 'Tree' couplers
- Star couplers
- Wavelength selective couplers
- Bulk and micro-optic technologies
- Fused fibre technology
- Planar waveguides technology
- Fibre-grating technology

T9 Components for WDM systems encompassing:

- Passive and active components for WDM systems
- Filters (Interference and Absorption)
- Bulk optical gratings
- Arrayed waveguides
- Attenuators
- Line and Band filters
- Equalising filters
- Fixed and Tunable filters
- Optical Isolators (including Faraday Effect)
- Dispersion compensators
- Multiplexers or combiners
- Demultiplexers or splitters

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REQUIRED SKILLS AND KNOWLEDGE

- Routers
- Add/Drop multiplexers
- Interconnection techniques used between optical components used in each optical
- Devices

T10 Operational principles of key photonic devices encompassing:

- The difference between multimode and single mode fibre,
- Attenuation,
- Dispersion
- Spontaneous and stimulated emission of light

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop engineering solutions to photonic problems as described in 8) and including:

A Understanding the extent of the photonic system problems.

B Forming effective strategies for solution development and implementation.

C Obtaining photonic system parameters,

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specifications and performance requirements appropriate to each problem.

D Testing and solutions to photonic system problems.

E Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.

F Documenting justification of solutions implemented in accordance with professional standards.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to developing engineering solutions to photonic problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing engineering solution for at least four photonic system problems.

Note.

Typical photonic system problems are those encountered in meeting performance requirements and compliance standards, revising photonic operating parameters and dealing with photonic system malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Section 1, Clause 1.4.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE129A Solve electrotechnical engineering problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the application of calculations required to solve electrotechnical engineering problems. It encompasses working safely, applying problem solving techniques, using a range of mathematical processes and techniques to providing solutions to electrotechnical problems, and justifying such solutions.

Note.

Typical electrotechnical problems are those encountered in meeting requirements in meeting performance requirements and compliance standards, revising systems operating parameters and dealing with system malfunctions

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Provide calculated solutions to electrotechnical engineering problems.	1.1	OHS procedures for a given work area are obtained and understood
	1.2	The nature of the problems are obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.3	Problems are clearly stated in writing and/or diagrammatic form to ensure they are understood and appropriate methods used to resolve them.
	1.4	Known constants and variable related to the problem are obtained from measured values or problem documentation.
	1.5	Alternative methods for resolving the problem are considered and where necessary discussed with appropriate person(s).
	1.6	Problems are solved using appropriate mathematical processes and techniques and within the realistic accuracy.
2 Complete work and document calculated solutions to electrotechnical activities	2.1	Justification for solutions used to solve electrotechnical engineering problems is documented for inclusion in work/project development records in accordance with professional standards.
	2.2	Work completion is documented and appropriate person(s) notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solve electrotechnical engineering problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE129A Electrotechnical engineering principles

Evidence shall show an understanding of electrotechnical principles to an extent indicated by the following aspects:

T1 Resistance encompassing:

- relationship between voltage, current and resistance and the power dissipated in a circuit
- value of voltage, current and resistance in a circuit given any two of these quantities
- the factors of length, cross-sectional area and material effect the resistance of conductors
- effects of temperature change on the resistance of various conducting materials
- features of fixed and variable resistor types and typical applications
- characteristics of temperature, voltage and light dependent resistors and typical applications of each

T2 Series circuits encompassing:

- measurement of resistance, voltage and current values in a single source series circuit
- the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities
- relationship between the voltage drops around a circuit and the applied voltage

T3 Parallel circuits encompassing:

- measurement of resistance, voltage and current values in a single-source parallel circuit
- the voltage, current, resistance or power dissipated from measured or given values of any of these quantities
- relationship between currents entering a junction and currents leaving a junction

T4 Series/parallel circuits encompassing:

- measurement of resistance, voltage and current values in a single-source series / parallel circuit
- the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities

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REQUIRED SKILLS AND KNOWLEDGE

T5 Measurement of electrical quantities encompassing:

- operating characteristics of analogue and digital meters
- selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application

T6 Capacitance/Capacitors encompassing:

- definition of capacitance and explain how a capacitor is charged
- the units by which capacitance is measured
- relationship between capacitance, voltage and charge
- behaviour of a series d.c. circuit containing resistance and capacitance components
- factors which determine the capacitance of a capacitor and explain how these factors are present in all circuits to some extent

T7 Magnetism and electromagnetism encompassing:

- field patterns around given permanent magnets
- magnetic field patterns around a straight current carrying conductor and a solenoid
- direction in which the magnetic field around a straight current carrying conductor

T8 Electromagnetic induction encompassing:

- factors required to induce an emf in a conductor

T9 Sinusoidal alternating voltage and current encompassing:

- how a sinusoidal voltage is generated in a single turn coil rotated in a uniform magnetic field
- definition of the terms ‘period’, ‘maximum value’, ‘peak-to-peak value’, ‘instantaneous value’, ‘average value’ and ‘root-mean-square (r.m.s.) value’ in relation to a sinusoidal waveform
- instantaneous value of induced voltage of a generated sinusoidal waveform
- root-mean-square (r.m.s.) value and frequency of a sinusoidal waveform from values of peak voltage and period

T10 Test equipment encompassing:

- operating principles of a CRO including block diagram of functional areas
- set up, calibration and use of an oscilloscope to measure d.c and a.c. voltages and frequency
- measurement of the instantaneous, peak, peak-to-peak values and the period of sinusoidal and other common waveforms provided by a signal generator
- calibration and limitation of CRO probes
- use of signal generator as a voltage source

T11 Phase relationships in a.c. circuits encompassing:

- phasor representation of graphical waveforms
- ‘in-phase’, ‘out-of-phase’, ‘phase angle’, ‘lead’, and ‘lag’
- convention for representing voltage, current and the reference quantity in a phasor

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REQUIRED SKILLS AND KNOWLEDGE

diagram

- phasor diagrams to show the relationship between two or more a.c. values of voltage and/or current

T12 Single-source resistive a.c. circuits of various frequencies encompassing:

- single-source a.c. circuit and taking resistance, voltage and current measurements
- voltage, current, resistances or power dissipated from measured or given values of any two of these quantities

T13 Inductance in a.c. circuits encompassing:

- concept of inductance, self-inductance and mutual inductance. (in terms of storage of magnetic energy)
- factors affecting inductance and how the unit of inductance is derived
- value of induced voltage in a given circuit
- how a series d.c. circuit containing resistance and inductance behaves
- ‘inductive reactance’
- inductive reactance of a given inductor and show the relationship between inductive reactance and frequency
- applying Ohm’s law to determine voltage, current or inductive reactance in a purely inductive a.c. circuit given any two of these quantities
- examples of inductive components in circuits and systems and describe their effect on the phase relationship between voltage and current

T14 Capacitance in a.c. circuits encompassing:

- capacitive reactance of a given capacitor and the relationship between capacitive reactance and frequency
- applying Ohm’s law to determine voltage, current or capacitive reactance in a purely capacitive a.c. circuit given any two of these quantities
- examples of capacitive components in electronic circuits and systems and describe their effect on the phase relationship between voltage and current

T15 Impedance in a.c. circuits encompassing:

- definition of ‘impedance’
- impedance of series, parallel and series-parallel circuits and draw diagrams showing the relationship between resistive, inductive and capacitive components
- single-source a.c. circuit with resistance, voltage and current measurements
- determination of the voltage, current or impedance from measured or given values of any two of these quantities
- using phasor diagrams to solve problems and show the relationship between voltages and currents in a.c. circuits

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Apply calculations required to solve electrotechnical problems as described in 8) and including:

A Clearly stating problems in written and diagrammatic form.

B Obtaining known constants and variable from an appropriate source.

C Solving problems using appropriate calculations

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D	Documenting justification of solutions provided in accordance with professional standards.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to applying calculations required to solve electrotechnical problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential

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knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solve electrotechnical engineering problems that apply to electrotechnical diagnostic and systems processes in the development of work functions in any of the following disciplines:

- Computer systems
- Electrical/Electronics
- Refrigeration and Air Conditioning
- Renewable Energy

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE130A Provide solutions and report on routine electrotechnology problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the application of fundamental numerical calculations required to solve routine electrotechnology problems and reporting the outcomes to requirements. It encompasses working safely, applying routine problem solving techniques, using a range of fundamental mathematical processes and techniques to identifying solutions to electrotechnology problems, and reporting the solutions.

Note.

Typical electrotechnology problems are those encountered in meeting routine performance requirements and compliance standards, interpreting the operating parameters of equipment and dealing with equipment malfunctions. Typical reports are those based on routine structures and formats, and require the application of routine communication fundamentals.

Application of the Unit

Application of the Unit

2)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 2 or higher

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	2	Writing	2	Numeracy	2

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Perform fundamental numerical calculations to solve routine electrotechnology problems.	1.1	OHS procedures for a given work area are obtained and understood
	1.2	The nature of the problems are obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.3	Problems are clearly stated in writing and/or diagrammatic form to ensure they are understood and appropriate methods used to resolve them.
	1.4	Known constants and variable related to the problem are obtained from measured values or problem documentation.
	1.5	Methods for resolving non-routine problems are considered and discussed with appropriate person(s).
	1.6	Routine problems are solved using fundamental numerical calculations with resultant outcome aligned to realistic accuracy.
	1.7	Solutions to routine problems are documented in accordance with established procedures.
2 Complete work and report on calculated solutions	2.1	Solutions used to solve routine electrotechnology problems are recorded for inclusion in work/project records/technical reports in accordance with requirements.
	2.2	Known reporting requirements and structures are identified and used to prepare for the production of technical reports, which communicate the outcomes solved to appropriate person(s).

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Reports are produced to communicate the solved outcomes in accordance with requirements.
	2.4	Work completion is documented and appropriate person(s) notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices, providing solutions to and reporting on routine electrotechnology problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE130A Electrotechnology Numeracy Diagnostic Assessment Methods

Evidence shall show an understanding of electrotechnology numeracy diagnostic assessment methods to an extent indicated by the following aspects:

T1 Electrotechnology Numeracy Diagnostic Test encompassing:

- Decimals
- Fractions and Indices
- Percentages
- Graphs
- Multiples and Sub Multiples
- Ratios and Proportions
- Transposition
- Areas and Volumes
- Trigonometry and Pythagoras' Theorem
- Construction of Angles and Triangles

T2 Recommendation of Remedial Action

- Action plan for remedial action
- Other support agencies
- Failure to follow action plan
- Monitoring of remedial action of learner

KS02-EE130A Electrotechnology Literacy Diagnostic Assessment Methods

Evidence shall show an understanding of electrotechnology literacy diagnostic assessment methods to an extent indicated by the following aspects:

T1 Electrotechnology Literacy Diagnostic Test encompassing:

- Reading Comprehension
- Spelling
- Sentence Construction (Syntax)
- Grammar

T2 Recommendation of Remedial Action

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REQUIRED SKILLS AND KNOWLEDGE

- Action plan for remedial action
- Other support agencies
- Failure to follow action plan

T3 Communicating with suppliers and clients

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to

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be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

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- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Apply fundamental calculations and standard reporting structures required to solve and report on routine electrotechnology problems as described in 8) and including:

A Identifying problems in written and diagrammatic form.

B Obtaining known constants and variables from an appropriate source to solve routine problems.

C Solving problems using appropriate fundamental calculations to achieve realistic and accurate outcomes.

D Using standard reporting structures and forms to prepare and produce routine documents/technical reports

E Interpreting and communicating solutions in routine documents/technical reports to appropriate person(s) in accordance with established procedures.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment,

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conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to applying fundamental calculations required to solve routine electrotechnology problems with realistic accuracy and formally reporting such outcomes to appropriate persons(s) and to requirements.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solve routine electrotechnology problems using fundamental numerical calculations in equipment processes in the deployment of work functions and reporting their outcomes in accordance with requirements in any of the following disciplines:

- Computers
- Data Communications
- Electrical
- Electronics
- Instrumentation
- Refrigeration and Air Conditioning

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE131A Solve problems in ELV circuits for non electrical workers

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers basic electrical fundamentals to support non electrical workers in jobs that incorporate some exposure to extra low voltage electricity. It encompasses working safely, recognising basic electrical components and the use of basic voltage, current and resistance measuring devices.

Application of the Unit

Application of the Unit **2)**

2.1) General Application

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

2.2) Importation

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Licensing/Regulatory Information

License to practice **3)**

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable

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License to practice **3)**

contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	2	Writing	2	Numeracy	2

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability

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Employability Skills	**5)** Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on simple extra-low voltage electrical circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.4	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Perform basic maintenance and inspection of simple extra low voltage electrical circuits.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where

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ELEMENT		PERFORMANCE CRITERIA	
			necessary in strict accordance OHS requirements and procedures.
		2.4	Basic maintenance and inspection procedures are followed.
3	Complete work and report maintenance and inspection activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in extra-low voltage single path circuits.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE131A ELV Electrical Fundamentals

Evidence shall show an understanding of electrical fundamentals for non electrical workers to an extent indicated by the following aspects:

T1 Basic electrical concepts encompassing:

- electrical current
- production of electricity by simple renewable and non renewable energy sources
- utilisation of electricity by various loads

T2 Basic electrical circuit encompassing:

- symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in a circuit diagram
- purpose of each component in the circuit
- voltage and current levels in a simple circuit
- relationship between voltage drops and resistance
- setting up and connecting a simple circuitmeasurement of resistance, voltage and current values in a simple circuiteffects of an open-circuit, a closed-circuit and a short-circuit

T3 Electrical power encompassing:

- concepts of power and energy
- effects of power rating of components

T4 Effects of electrical current encompassing:

- physiological effects of current and the fundamental principles (listed in AS/NZS 3000) for protection against the this effect
- typical uses of the effects of current
- fundamental principles (listed in AS/NZS3000) for protection against the damaging effects of current

T5 Electrical energy sources encompassing:

- principles of producing an electric current from motor generator sets
- principles of producing an electrical current from photo-voltaic arrays
- principles of producing an electrical current from primary, and secondary cells

T6 Resistance encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- power loss (heat) occurring in a conductor.
- effect of losses in electrical wiring and machines
- measurement of resistance

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Performing basic maintenance on simple extra-low voltage

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circuits as described in 8) and including:

A	Following basic maintenance procedures
B	Reporting information arising from basic maintenance and inspection.
C	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to in extra-low voltage single path circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended

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for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

- This unit shall be demonstrated in relation to simple circuits as they apply to maintenance work functions in any of the following disciplines:
  - Renewable and sustainable energy systems, and
  - Remote area essential service operations
- In relation to the following on at least two occasions:
  - Identifying the components of an existing circuit
  - making and reporting measurements of circuit parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers identifying occupational health and safety hazard and risks and documenting control measures. It encompasses identifying workplace hazards, assigning levels of risk, developing control measures to eliminate and/or mitigate risks, reviewing risk control measures and maintaining documentation of hazards, risk control measures and their application in accordance with compliance procedures.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this competency standard unit contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this competency standard unit is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

This unit addresses information, processes and techniques for the application of occupational health and safety specific to working with electrotechnology and is essential for employees without managerial or supervisory responsibilities

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Identify and document hazards and risks.	1.1	Hazards are identified the appropriate persons involved and in accordance with compliance procedures. Note: Typically this will relate to such things as: The type of job, Electrical conditions, Energy levels, Radiation levels, Toxic substances, Airborne particles, Pressure discharge, Explosive atmosphere, Work-site location, General work-site conditions, Specific work location, Moving parts, Tools and equipment, Workers

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ELEMENT		PERFORMANCE CRITERIA	
			competence and/or capacity and/or personal effects
		1.2	Risks associated with identified hazards are determined in consultation with others and documented in accordance with compliance procedures.
		1.3	Provision is made to accommodate changes to documentation should unforseen hazards be identified.
2	Assign levels of risk and develop and document control measures.	2.1	Level of risk is assigned for each identified hazard in accordance with the regulations and following compliance procedures.
		2.2	Control measures are developed for hazard, level of risk and activity to eliminate and/or mitigate the risk following compliance procedures.
		2.3	Hazard, level of risk and control measures are agreed to and documented in consultation with all involved in accordance with compliance procedures.
3	Monitor and review the control measures.	3.1	Documented control measures are made available for reference by all involved with the work.
		3.2	Control measures are modified where required in consultation with all involved with the work in accordance with compliance procedures.
		3.3	Documentation of hazards, risk control measures and their application are filed in accordance with compliance procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and documenting occupational hazards and risks in electrical.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE137A Risks and control measures for dealing with workplace hazards

Evidence shall show an understanding of risks and control measures for dealing with workplace hazards to an extent indicated by the following aspects:

T1 Risk management and assessment of risk encompassing:

- Principle and purpose of risk management, and
- Processes for conducting a risk assessment
- Hazard identification by job analysis and work-site inspections
- Recording hazards and assessing the risk.

T2 Hazards and risks and control measures in working on construction sites encompassing:

- Hazards include manual and mechanical handling; working at heights; working in confined spaces; noise; dusts, gases, chemicals.

T3 Hazards associated with extra-low voltage, low-voltage and high-currents encompassing:

- Arrangement of power distribution and circuits in electrical installations
- Parts of an electrical system and equipment that operate at low-voltage and extra-low voltage,
- Parts of an electrical system and equipment where high-currents are likely.

T4 Hazards and risks and control measures associated with high-voltage encompassing:

- Parts of an electrical system and equipment that operate at high-voltage,
- The terms ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage
- Control measures used for dealing with the hazards of high-voltage.

T5 Hazards and risks and control measures in working with low voltage equipment encompassing:

- Risks in modifying electrical installations, fault finding, maintenance and repair.

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REQUIRED SKILLS AND KNOWLEDGE

- Control measures before, while and after working on electrical installations, circuits or equipment.
- Isolation and tagging-off procedures.
- Risks and restrictions in working live.
- Control measures for working live.

T6 Hazards and risks and control measures associated with harmful, devices, materials, gases, dusts and airborne contaminant encompassing:

- Harmful devices: gas touches, welding equipment, laser equipped devises and the like.
- Harmful materials: gases (refrigerants) and some industrial cleaning agents, fibres of optical cable, thermal insulation
- Harmful airborne contaminants: fibres of thermal insulation, fibres of optical cable, fibrous cement materials, asbestos and other fibres in insulation materials.

T7 Determine the degree of the risk encompassing:

- The three recognised levels of risk are:
  - High (potential to kill or permanent disability);
  - Medium (potential to cause an injury or illness of a permanent nature);
  - Low (potential to cause a cause minor injury requiring first aid but no permanent disability)

T8 Use control measures to eliminate or control the risk encompassing:

- Hierarchy of control measures are:
  - eliminate the risk by discontinuing the activity.
  - control the risk by redesigning the equipment
  - adopt administrative procedures
  - use of personal protective equipment.
- Control measures are formally documented in Job Safety Analysis (JSAs) or Safe Work Methods (SWMs).

T9 Engaging in monitoring and reviewing processes to ensure control measures remain valid.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

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EVIDENCE GUIDE

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also

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EVIDENCE GUIDE

comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Document and applying measure to control occupational health and safety risks in electrotechnology work as described in 8) and including:

    A Identifying with appropriate person and in accordance with compliance procedures.

    B Determining the risk associated with identified hazards

    C Assigning the risks and developing and documenting control measures.

    D Reviewing and modifying control measures where required.

    E Recording activities.

    F Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to documenting occupational hazards and risks in electrical.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with other related units making up a qualification or possible skill clusters.

Components of this unit are also included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to electrotechnology work functions, including but limited to: installation, testing, inspection, fault finding, maintenance or development work functions covering:

- Relevant occupational health and safety legislation, regulations and codes of practice related to devices and systems and hazards present in residential, commercial and industrial workplaces.
- Accepted industry work procedures and the specific safety procedures and work instructions for a particular workplace or organistaion.

In any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation and Control
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology
- Energy Supply, Transmission and Distribution Networks

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RANGE STATEMENT

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Electrotechnology

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UEENEEE141A Use of routine equipment/plant/technologies in an energy sector environment

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Correct title of pre-requisite to reflect unit title	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers routine tools, equipment and personnel protective equipment required to do work in the energy sector environment, is used in accordance with the schedule of work to ensure work is completed in an agreed time, to a quality standard and with a minimum waste.

Application of the Unit

Application of the Unit

2)

This unit shall apply to persons entering work in energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of

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License to practice **3)**

training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to use routine equipment, plant and technologies	1.1	Instructions in the use of routine equipment, plant or technologies are communicated and confirmed to ensure clear understanding.
	1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply in the carrying out of the work.
	1.3	Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
	1.5	Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures.

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Schedule of work including practices for working safely are confirmed in accordance with instructions and requirements.
2	Use routine equipment, plant and technologies	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents.
		2.2	Routine equipment, plant or technologies are used in accordance with schedule of work to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
		2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
		2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3	Complete use of routine equipment, plant and technologies	3.1	Final checks are made to ensure the use of routine equipment, plant or technologies conforms with instructions and to requirements.
		3.2	Appropriate personnel are notified of completion of the work using routine equipment, plant or technologies.
		3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
		3.5	Appropriate records are updated in accordance with instructions and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and using routine equipment/plant/technologies in an energy sector environment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE141A Energy sector equipment/plant/technologies

Evidence shall show an understanding of energy sector equipment/plant/technologies to an extent indicated by the following aspects:

T1 Electrical concepts encompassing:

- Electrical supply and distribution within a building or premises
- Arrangement of circuits
- Protection for safety requirements and their practice
- Difference between alternating and direct current
- Measurement and calculation of voltage, current, resistance and power in practical circuits.
- Concepts and applications of magnetism and electromagnetic induction
- Transformer operating principles and their application
- Hazards associated with electrical systems and apparatus.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that

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can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use of routine equipment/plant/technologies in an electrotechnology environment as described in 8) and including:

A Understanding work instruction.

B Obtaining and checking tools and equipment.

C Following work schedules.

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D	Using routine equipment/plant/technologies in accordance with work schedules.
E	Returning tools and surplus resources as required.
F	Updating work records.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to using routine equipment/plant/technologies in an energy sector environment.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to the use of routine equipment/plant/technologies in an energy sector environment in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE142A Produce products for carrying out energy sector work activities

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers products required to do work in the energy sector environment are produced in accordance with the schedule of work ensuring work is completed in an agreed time, to a quality standard and with a minimum waste.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work

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License to practice **3)**

platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to produce routine products.	1.1	Instructions for preparing the work activity are communicated and confirmed to ensure clear understanding routine products.
	1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply to the carrying out of the work.
	1.3	Necessary tools, equipment and personnel protective equipment are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
	1.5	Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Schedule of work including practices for working safely are confirmed in accordance with instructions and requirements.
2 Produce routine products.	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents products.
	2.2	Schedule of work is followed to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
	2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
	2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3 Check results of products produced.	3.1	Final checks are made to ensure the completed work conforms with instructions and to requirements products produced.
	3.2	Appropriate personnel are notified of completion of the work.
	3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
	3.5	Appropriate records are updated in accordance with instructions and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and producing routine products for carrying out electrotechnology work activities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE142A Energy sector engineering practices

Evidence shall show an understanding of drawings interpretation and sketching, hand tools/ fixed and portable tools and their use, techniques for assembling and dismantling electrotechnology apparatus and welding to an extent indicated by the following aspects:

T1 Basic technical drawing conventions and symbols

T2 Freehand technical sketching techniques

T3 Hand tools for cutting, shaping, drilling, threading, tapping, and finishing metallic and non-metallic components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

T4 Tools for measuring and marking out.

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

T5 Tools for dismantling and assembling electrical and electronic components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

T6 Fixed power tools for cutting, shaping, drilling, and finishing metallic and non-metallic components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of fixed power tools

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REQUIRED SKILLS AND KNOWLEDGE

T7 Portable power tools for cutting, shaping, drilling, and structural components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of fixed power tools
- requirements for use on construction sites.

T8 Purpose of sequencing dismantling and assembling.

T9 Importance of marking/labelling and storing parts

T10 Techniques for dismantling and assembling close fitting parts.

T11 Use of gasket and seals.

T12 Hazards associated with welding activities and equipment

T13 Welding processes and industry applications

T14 Thermal cutting techniques

T15 Manual metal arc welding processes

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work

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environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control

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measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Produce routine products for carrying out energy sector work activities as described in 8) and including:

A	Understanding work instructions.
B	Obtaining and checking tools and equipment.
C	Following work schedules.
D	Producing products in accordance with work schedule.
E	Returning tools and surplus resources as required.
F	Updating work records.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to producing routine products for carrying out energy sector work activities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to producing routine products for carrying out energy sector work activities in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE143A Produce routine tools/devices for carrying out energy sector work activities

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers routine tools/devices required to do work in the energy sector environment are produced in accordance with the schedule of work ensuring work is completed in an agreed time, to a quality standard and with a minimum waste.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work

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License to practice **3)**

platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of

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Employability Skills	**5)** competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to produce routine products.	1.1	Instructions for preparing the work activity are communicated and confirmed to ensure clear understanding routine products.
	1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply to the carrying out of the work.
	1.3	Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
	1.5	Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures
	1.6	Schedule of work including practices for working safely are confirmed in accordance with instructions and requirements

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ELEMENT	PERFORMANCE CRITERIA	
2 Produce routine products.	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents products.
	2.2	Schedule of work is followed to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
	2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
	2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements
3 Check results routine tools and devices produced.	3.1	Final checks are made to ensure the completed work conforms with instructions and to requirements routine tools and devises produced.
	3.2	Appropriate personnel are notified of completion of the work.
	3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
	3.5	Appropriate records are updated in accordance with instructions and established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and producing routine tools/devices for carrying out electrotechnology work activities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE143A Energy sector tools and devices

Evidence shall show an understanding of tools used in the energy sector work environment and engineering practice to an extent indicated by the following aspects:

T1 Hand tools for cutting, shaping, drilling, threading, tapping, and finishing metallic and non-metallic components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

T2 Tools for measuring and marking out.

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

T3 Tools for dismantling and assembling electrical and electronic components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of hand tools

T4 Fixed power tools for cutting, shaping, drilling, and finishing metallic and non-metallic components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools
- hazards associated with their use
- care and maintenance of fixed power tools

T5 Portable power tools for cutting, shaping, drilling, and structural components encompassing:

- types of tools and their purpose
- techniques for the correct and safe use of these tools

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REQUIRED SKILLS AND KNOWLEDGE

- hazards associated with their use
- care and maintenance of fixed power tools
- requirements for use on construction sites.

T6 Scope of engineering practice work and responsibilities encompassing:

- Working with others in a project team
- Maintaining currency in technical and regulatory developments
- Applying and working to ethical standards

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment

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- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Produce routine tools/devices for carrying out electrotechnology work activities as described in 8) and including:

A	Understanding work instructions.
B	Obtaining and checking tools and equipment.
C	Following work schedules.
D	Producing products in accordance with work schedule.
E	Returning tools and surplus resources as required.
F	Updating work records.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

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Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to producing routine tools/devices for carrying out energy sector work activities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to producing routine tools/devices for carrying out energy sector work activities in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE144A Apply technologies and concepts to energy sector work activities

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers undertake energy sector work activities using a range of technologies such as computers, and apply analytical concepts to achieve the desired outcome ensuring work is completed in an agreed time, to a quality standard and with a minimum of waste.

Application of the Unit

Application of the Unit

2)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and

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Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to apply technologies and concepts.	1.1	Instructions for the preparation to apply technologies and concepts are communicated and confirmed to ensure clear understanding.
	1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply to the carrying out of the work.
	1.3	Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
	1.5	Resources and materials needed to apply technologies and concepts are confirmed, scheduled and obtained in accordance with established procedures.
	1.6	Schedule to apply technologies and concepts, including practices for working safely, are confirmed in accordance with instructions and requirements.
2 Use technologies and apply concepts to the carrying out of work.	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents.
	2.2	Schedule of using technologies and applying concepts to the achieving the desired outcome is followed to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
	2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
	2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Check results in the use of technologies and applications of concepts.	3.1	Final checks are made to ensure the use of technologies and applications of concepts conforms with instructions and to requirements.
	3.2	Appropriate personnel are notified of completion in the use of technologies and applications of concepts.
	3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
	3.5	Appropriate records are updated in accordance with instructions and established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and applying technologies and concepts to energy sector work activities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE144A Energy sector technologies and concepts

Evidence shall show an understanding of using personal computers and computers hardware structure to an extent indicated by the following aspects:

T1 Starting up

T2 Selecting application

T3 Entering information

T4 Saving

T5 Printing

T6 Structure and components and their function

Note:

Examples include motherboards, memory modules, video modules, connecting buses, storage devices and the like.

T7 Assembling and dismantling techniques

T8 Hardware faults and troubleshooting techniques

Note:

Confined to subsystem level

T9 Basic network hardware and components

T10 Connection of network media

T11 Set up of standard network configuration

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Apply technologies and concepts to energy sector work activities as described in 8) and including:

A Understanding work instruction.

B Obtaining and checking tools and equipment.

C Following work schedules.

D Using technologies and applying concepts

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	appropriately.
E	Returning tools and surplus resources as required.
F	Updating work records.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to applying technologies and concepts to energy sector work activities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3

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'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to producing routine products for carrying out energy sector work activities in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology
- Wholesaling

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE145A Apply computation when using equipment/materials/concepts in an energy sector environment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers undertaking computations to produce appropriate results using a range of equipment, materials and concepts in carrying out energy sector work activities, whilst ensuring work is completed in an agreed time, to a quality standard and with a minimum of waste.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in electrotechnology and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work

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License to practice **3)**

platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to apply computations when using equipment, materials and concepts.	1.1	Instructions for the preparation to apply computations when using equipment, materials or concepts are communicated and confirmed to ensure clear understanding.
	1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply to the carrying out of the work.
	1.3	Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4	Appropriate personnel are consulted to ensure computations when using equipment, materials or concepts is coordinated effectively with others involved.
	1.5	Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures.
	1.6	Schedule of computations to be applied when using equipment, materials or concepts, including practices for working safely, are confirmed in accordance with instructions and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
2 Carry out computations when using equipment, materials and concepts.	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents.
	2.2	Schedule of computations is followed to ensure the use equipment, materials or concepts is completed in an agreed time, to a quality standard and with a minimum of waste.
	2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
	2.4	Ongoing checks of quality of the computations are undertaken in accordance with instructions and requirements.
3 Confirm results of computations when using equipment, materials and concepts.	3.1	Confirm results of computations when using equipment, materials and concepts.
	3.2	Appropriate personnel are notified of completion of the computations.
	3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
	3.5	Appropriate records are updated in accordance with instructions and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and applying computation when using equipment/materials/concepts in an electrotechnology environment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE145A Applied mathematics concepts

Evidence shall show an understanding of applied mathematical concepts to an extent indicated by the following aspects:

T1 Mathematical linear measurement in engineering situations encompassing:

- Precision and error in mathematical computations and
- Displaying mathematical outcomes in the correct format using the appropriate significant figures and in scientific notation
- Perimeters of plane figures, polygons and the perimeter of shapes involving arcs
- Pythagoras' theorem to engineering situations

T2 Mathematical spatial measurement in engineering situations encompassing:

- Areas of combined shapes
- Volume and surface areas of solids

T3 Right triangle trigonometry in engineering problem solving encompassing:

- Problems using the six trigonometrical ratios
- Problems involving compass bearings and angles of elevation/depression
- Trigonometrical concepts in problems involving inclined planes, vectors and forces and electrical sinusoidal waveforms

T4 Sine and cosine rules in practical applications encompassing:

- Sine rule to solve unknown dimensions/angles in triangles
- Cosine rule to solve unknown dimensions/angles in triangles

T5 Mathematical concepts in basic surveying and computation of areas encompassing:

- Mathematical concepts for radial and triangulation surveys
- Simpson's Rule in engineering applications

T6 Basic algebra in engineering calculations encompassing:

- Basic operations involving substitutions, additions, removal of brackets, multiplication and divisions
- Solving linear equations
- Transportation in non-linear equations

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REQUIRED SKILLS AND KNOWLEDGE

T7 Linear graphical techniques in engineering problem solving encompassing:

- Graphing linear functions
- Deriving equations from graphs and tables
- Solving simulations equations algebraically and graphically
- The best line of fit graphically and determine equation

T8 Mathematical computations involving polynomials encompassing:

- Adding, subtracting and multiplying polynomials
- Factorising trinomials
- Solving quadratic equation

T9 Mathematical computations involving quadratic graphs encompassing:

- Graphs of quadratic functions
- Maxima and minima
- Graphical solutions of quadratic equations
- Properties of a parabola
- Applications of parabolas in engineering applications

T10 Trigonometry and graphical techniques in engineering outcomes encompassing:

Graphs of trigonometric functions e.g.: $V=V_m\sin\theta, I=I_m\cos\theta$

- Addition of equations such as: $v\sin\theta + u\sin(\theta + \phi)$ graphically
- Simpson's Rule to determine the average and root mean square values of a sinusoidal waveform

T11 Statistical data presentation encompassing:

- Appropriate presentation of frequency tables, histograms, polygons, stem and leaf plots
- Advantages of different visual presentations

T12 Appropriate sampling techniques for gathering data encompassing:

- Design of surveys and census
- Sample data using correct technique

T13 Use of the measures of central tendency encompassing:

- Estimation of percentiles and deciles from cumulative frequency polygons (ogives)
- Interpreting data from tables and graphs including interpolation and extrapolation
- Analysing misleading graphs

T14 Measures of dispersion in statistical presentations encompassing:

- Box-and-whisker graphs
- Measures of dispersion using variance and standard deviation

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REQUIRED SKILLS AND KNOWLEDGE

- Standardised scores including Z-scores

T15 Correlation and regression techniques encompassing:

- Interpreting scatter plots
- Correlation coefficients
- Calculate the regression equation and use for prediction purposes

T16 Elementary probability theory encompassing:

- Probabilities in everyday situations
- Counting techniques: factorials; permutations; combinations

T17 Paschal's Triangle and the Normal Curve encompassing:

- Paschal's triangle
- Characteristics of the normal curve
- Standard Deviation and applications to everyday occurrences
- Probabilities using the normal curve

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry

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and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as

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specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Apply computation when using equipment/materials/concepts in an electrotechnology environment as described in 8) and including:

A	Understanding work instruction.
B	Obtaining and checking tools and equipment.
C	Following work schedules.
D	Applying computations accurately.
E	Returning tools and surplus resources as required.
F	Updating work records.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above in Context of and specific resources for assessment, evidence should show demonstrated competency in applying computation when using equipment/materials/concepts in an energy sector environment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to applying computation when using equipment/materials/concepts in an energy sector environment work activities in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE146A Identify effects of energy on machinery and materials in an energy sector environment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers effects of energy on machinery and/or materials used in an energy sector environment are identified and completed in an agreed time, to a quality standard and using appropriate technology mediums, where required. It encompasses working safely, applying knowledge of identifying the effects of energy on machinery and materials in an electrotechnology environment.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills	**5)** qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to identify effects of energy on machinery and materials.	1.1 Instructions for identifying effects of energy on machinery or materials are communicated and confirmed to ensure clear understanding.
	1.2 OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply to the carrying out of the work.
	1.3 Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4 Appropriate personnel are consulted to ensure effects of energy on machinery or materials are identified and coordinated effectively with others involved.
	1.5 Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures.
	1.6 Schedule for identifying effects of energy on machinery or materials including practices for working safely are confirmed in accordance with instructions and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
2 Identify effects of energy on machinery and materials.	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents.
	2.2	Schedule for identifying effects of energy on machinery or materials work is followed to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
	2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
	2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3 Check results of the effects of energy on machinery and materials.	3.1	Final checks are made to ensure the effects of energy on machinery or materials as identified conforms with instructions and to requirements.
	3.2	Appropriate personnel are notified of completion of the computations.
	3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
	3.5	Appropriate records are updated in accordance with instructions and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and identifying effects of energy on machinery and materials in an energy sector environment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE146A Applied physics concepts

Evidence shall show an understanding of applied physics concepts to an extent indicated by the following aspects:

T1 Motion in two dimensions encompassing:

- vertical and horizontal components of velocity
- determination of the vertical component of velocity
- resolution of velocity into components
- time of flight, range, effect of air resistance
- centripetal acceleration, force causing the centripetal acceleration
- Newton's law of universal gravitation
- satellites in circular orbits
- Momentum in two dimensions

  Note:

  Examples are: vector form of Newton's second law of motion, Newton's second law of motion in terms of momentum, law of conservation of momentum

T2 Electricity and magnetism encompassing:

- Electric fields

  Note:

  Examples are: Coulomb's law, principle of superposition, electric field, pictorial representation of electric fields, superposition of electric fields, electric field due to one or two charged plates, electric fields and conductors, electric field inside a hollow conductor, electric fields near sharp points
- The motion of charges particles in electric fields

  Note:

  Examples are: electric, potential difference, acceleration in a constant electric field, motion of a charged particle in a constant electric field
- Magnetic fields

  Note:

  Examples are: magnetic fields and their pictorial representation, magnetic force on a current-carrying conductor

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REQUIRED SKILLS AND KNOWLEDGE

- The motion of charges particles in magnetic fields

  Note:

  Examples are: force on a charged particle in a magnetic field, motion of a charged particle at right angles to a magnetic field

T3 Light and matter

- Electromagnetic waves

  Note:

  Examples are: characteristics of electromagnetic waves, speed, frequency and wavelength

  The interference of light

  Note:

  Examples are: coherent wave sources, interference, two-source interference, diffraction, two-slit interference, transmission diffraction gratings, speckle
- Photons

  Note:

  Examples are: photons, the photoelectric effect, x-rays
- Wave behaviour of particles

  Note:

  Examples are: wave behaviour of particles, experimental evidence for wave behaviour of particles

T4 Atoms and nuclei

- The structure of the atom

  Note:

  Examples are: line emission spectrum, energy levels in atoms, spectrum of atomic hydrogen, ionization energy, continuous spectrum, line absorption spectrum, fluorescence, stimulated emission
- The structure of the nucleus

  Note:

  Examples are: composition of nuclei, the nucleon force, isotopes, mass defect and binding energy, conservation laws in nuclear reactions
- Radioactivity

  Note:

  Examples are: stable and unstable nuclei, types of decay of unstable nuclei, alpha decay, beta minus decay, beta plus decay, half-life and activity
- Nuclear fission and fusion

  Note:

  Examples are: spontaneous and induced nuclear fission, chain reaction

T5 Skills

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REQUIRED SKILLS AND KNOWLEDGE

- Experimental skills

  Note:

  Examples are: purpose and variables, procedure, observation, presentation, interpretation
- Investigation design skills

  Note:

  Examples are: designing and investigation, evaluating and investigation
- Information skills

  Note:

  Examples are: planning an information search, searching for information, evaluating information
- Communication skills

  Note:

  Examples are: oral communication, written communication, evaluation of oral and written communications

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside

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the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Identify effects of energy on machinery and materials in an energy sector environment as described in 8) and including:

A	Understanding work instruction.
B	Obtaining and checking tools and equipment.
C	Following work schedules.
D	Identifying the effects of energy appropriately.
E	Returning tools and surplus resources as required.
F	Updating work records.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to identifying effects of energy on machinery and materials in an energy sector environment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to identifying effects of energy on machinery and materials in energy sector environments in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE147A Identify building techniques, methods and materials used in energy sector work activities

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers identifying a range of techniques, methods and materials used in energy sector work activities including types of fixing devices, segregation requirements, fixing structures, walls and floor structures, lifting techniques and other related building materials.

It encompasses working safely, applying knowledge of identifying building techniques, methods and materials used in electrotechnology work activities.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to identify building techniques, methods and materials.	1.1	Instructions for identifying building techniques, methods and materials used in electrotechnology work are communicated and confirmed to ensure clear understanding.
	1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply to the carrying out of the work.
	1.3	Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4	Appropriate personnel are consulted to ensure the identification of building techniques, methods and materials used is coordinated effectively with others involved.
	1.5	Resources and materials needed to do the work

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ELEMENT		PERFORMANCE CRITERIA	
			are confirmed, scheduled and obtained in accordance with established procedures.
		1.6	Schedule for identifying building techniques, methods and materials used including practices for working safely are confirmed in accordance with instructions and requirements.
2	Identify building techniques, methods and materials.	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents.
		2.2	Schedule to identify building techniques, methods and materials used is followed to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
		2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
		2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3	Confirm building techniques, methods and materials used.	3.1	Final checks are made to ensure the identification of building techniques, methods and materials used conforms with instructions and to requirements.
		3.2	Appropriate personnel are notified of completion to identify techniques, methods and materials used.
		3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
		3.5	Appropriate records are updated in accordance with instructions and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and identifying building techniques, methods and materials used in energy sector work activities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE147A Energy sector science and materials

Evidence shall show an understanding of electrotechnology science and materials to an extent indicated by the following aspects:

T1 Trade calculations encompassing:

- mathematical techniques
- relevant calculations
- linear measurement, areas, volumes, ratios

T2 Engineering mechanics encompassing:

- base physical quantities
- concepts, principles, S.I. units, their applications in
- engineering calculations in relation to physical quantities and
- associated formulae
- mass, velocity, acceleration, force, weight, density, angles
- energy/work/power
- moments/torque
- centre of gravity
- mechanical advantage
- levers
- pulley blocks
- efficiency
- friction
- vectors
- resolution of forces
- forces in strung conductors
- forces on poles and towers
- determination of sag
- pressure/stress
- elementary fluid mechanics

T3 Engineering materials encompassing:

- classification

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REQUIRED SKILLS AND KNOWLEDGE

- ferrous and non-ferrous metals
- steels, alloys,
- properties
- tensile strength
- temperature and expansion in metals
- stress and strain
- ductility
- applications
- corrosion
- galvanic corrosion
- hardwoods and soft woods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

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access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Identify building techniques, methods and materials used in energy sector work activities as described in 8) and including:

A	Understanding work instruction.
B	Obtaining and checking tools and equipment.
C	Following work schedules.
D	Returning tools and surplus resources as required.
E	Updating work records.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

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Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to identifying building techniques, methods and materials used in energy sector work activities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to identifying building techniques, methods and materials used in energy sector work activities in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE148A Carry out routine work activities in an energy sector environment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers undertake scheduled routine work activities in the energy sector in an agreed time, to a quality standard and with a minimum of waste It encompasses working safely, applying knowledge of carrying out routine work activities in electrotechnology environments.

Application of the Unit

Application of the Unit

2)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License

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to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting

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License to practice **3)**

and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to undertake routine work activities.	1.1	Instructions for preparing the work activity are communicated and confirmed to ensure clear understanding.
	1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply to the carrying out of the work.
	1.3	Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
	1.5	Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures.
	1.6	Schedule of work including practices for working safely are confirmed in accordance with instructions and requirements.
2 Carry out work as instructed.	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents.
	2.2	Schedule of work is followed to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
	2.3	Knowledge of electrotechnology practices and electrical principles are applied to routine work

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ELEMENT	PERFORMANCE CRITERIA	
		activities.
	2.4	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
	2.5	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3 Check results of the completed work.	3.1	Final checks are made to ensure the work conforms with instructions and to requirements.
	3.2	Appropriate personnel are notified of completion of the work.
	3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
	3.5	Appropriate records are updated in accordance with instructions and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out routine work activities in an electrotechnology environment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE148A Energy sector organisations and practises

Evidence shall show an understanding of energy sector industry organisations and practices to an extent indicated by the following aspects:

T1 Energy sector vocations encompassing:

- Electrical
- Electronics and communications
- Computer Systems
- Data Communication
- Refrigeration and Air Conditioning
- Instrumentation and Control
- Rail signalling
- Lifts
- Electricity supply – generation, transmission and distribution
- Gas industry

T2 Career paths in energy sector encompassing:

- Australian Qualification Framework (AQF)
- Qualifications/Classifications
- Scope of work-installation, maintenance and servicing

T3 Training in energy sector vocations encompassing:

- Traineeships, apprenticeships
- Licensed Electrician minimum requirements
- Career advancements

T4 Industry Organisations encompassing:

- Employers – NECA, ECA, ME, ENA
- EE-Oz Training Standards and EE-Oz State/Territory Network
- Employee – Trade union group (CEPU, ETU)
- Government - ITABs, TAFE, RTO, ERAC
- Private providers

T5 Qualification Requirements encompassing:

- Unit of competency

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REQUIRED SKILLS AND KNOWLEDGE

- Qualification assessments

T6 Policies and Practices in energy sector industry encompassing:

- Licensing requirements
- OH&S requirements
- Awards

T7 Job application encompassing:

- Research
- Writing
- Methods of application

T8 Job interview encompassing:

- Preparation
- Presentation
- Evaluation

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry

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and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as

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specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out routine work activities in an energy sector environment as described in 8) and including:

A	Understanding work instruction.
B	Obtaining and checking tools and equipment.
C	Following work instructions.
D	Returning tools and surplus resources as required.
E	Updating work records.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.

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- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out routine work activities in an energy sector environment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out routine work activities in energy sector environments in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE149A Contribute to the operation of support plant and equipment used in electricity supply industry

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers contributing to the operation of support plant and equipment used in the Electricity Supply Industry for scheduled work, in an agreed time, to a quality standard and with a minimum of waste. It encompasses working safely, applying knowledge of contributing to the operation of support plant and equipment used in electricity supply.

Application of the Unit

Application of the Unit

2)

This unit shall apply to persons entering work in energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various

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License to practice **3)**

jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to contribute to operating plant and equipment.	1.1	Instructions for preparing to contribute to operating plant and equipment are communicated and confirmed to ensure clear understanding.
	1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply to the carrying out of the work.
	1.3	Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
	1.5	Resources and materials needed to do the work are confirmed, scheduled and obtained in

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ELEMENT		PERFORMANCE CRITERIA	
			accordance with established procedures.
		1.6	Schedule of work including practices for working safely are confirmed in accordance with instructions and requirements.
2	Contribute to operating plant and equipment.	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents.
		2.2	Plant and equipment is operated according to schedule of work to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
		2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
		2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3	Complete contribution to operating plant and equipment.	3.1	Final checks are made to ensure the operation of plant and equipment conforms with instructions and to requirements.
		3.2	Appropriate personnel are notified of completion of the work in contributing to operating plant and equipment.
		3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
		3.5	Appropriate records are updated in accordance with instructions and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the operation of support plant and equipment used in electricity supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE149A ESI Powerline safety practices

Evidence shall show an understanding of working safely on or around powerlines through the application of risk management principles and control measures for dealing with hazards typical around powerlines. The following aspects indicate the extent of understanding required.

T1 Items of protective apparatus and apparel used by ESI workers and states their applications.

T2 Methods of carrying, erecting, collapsing and lower an extension ladder

T3 Maintenance requirements for wood and fiberglass ladders.

T4 Methods of climbing and working on an overhead structure encompassing::

- determining whether a pole is safe to climb.
- inspecting lineworkers body belt.
- knots and hitches appropriate to the requirements of a lineworker.

T5 Procedures for establishing an effective road traffic management scheme encompassing:

- purpose of traffic management in accordance with relevant statutory requirements.
- lineworkers responsibilities in accordance with relevant statutory and electricity supply industry requirements.
- procedure used to provide an effective traffic management scheme.
- use of a two-way radio.

T6 Application of various fire fighting mediums and operation equipment used to extinguish small fires compassing;

- extinguishing mediums for various types of fires.
- precautions for personal protection when fighting small fires.
- selection and operation of the appropriate portable fire extinguisher for a specific type of fire.

T7 Rescue procedures for victims who become incapacitated encompassing:

- procedure for rescuing a person from heights.
- procedure to rescue a person from confined spaces

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Contribute to the operation of support plant and equipment used in electricity supply as described in 8) and including:

A Understanding work instruction.

B Obtaining and checking tools and equipment.

C Following work instruction.

D Operating plant and equipment safely and

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correctly.

E Returning tools and surplus resources as required.

F Updating work records.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to contributing to the operation of support plant and equipment used in electricity supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3

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'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to contributing to the operation of support plant and equipment used in electricity supply in any of the following disciplines:

- Data Communications
- Electrical
- Renewable / sustainable energy

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE150A Undertake computations in an energy sector environment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers computational and mathematical procedures to solve problems or to enhance given data. It encompasses working safely, applying knowledge of undertaking computations in energy sector environment.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to undertake computations.	1.1	Computational activities are planned and prepared to ensure OHS policies and procedures are followed, with the work appropriately sequenced in accordance with requirements.
	1.2	Data for computations are obtained and verified in accordance with established procedures and to comply with requirements.
	1.3	Location in which activities are undertaken or data gathered is determined from job requirements.
	1.4	Materials/devices needed to carry out the computations are obtained in accordance with established procedures.
2 Undertake computations.	2.1	OHS policies and procedures for undertaking monitoring activities are followed.
	2.2	Computations are undertaken in accordance with requirements.
	2.3	Unplanned events or conditions are responded to in accordance with established procedure.
	2.4	Ongoing checks of the quality/accuracy of the work are undertaken in accordance with established procedures.
3 Complete monitoring activities.	3.1	Computations are verified and checked against estimates.
	3.2	Documentation/reports/computations are completed to ensure all requirements are met.
	3.3	Work completion is notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and undertaking computations in an energy sector environment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE150A Energy sector applied mathematical concepts

Evidence shall show an understanding concepts of engineering mathematics with calculus to an extent indicated by the following aspects:

T1 Mathematical linear measurement in engineering situations encompassing:

- Precision and error in mathematical computations and
- Displaying mathematical outcomes in the correct format using the appropriate significant figures and in scientific notation
- Perimeters of plane figures, polygons and the perimeter of shapes involving arcs
- Pythagoras' theorem to engineering situations

T2 Mathematical spatial measurement in engineering situations encompassing:

- Areas of combined shapes
- Volume and surface areas of solids

T3 Right triangle trigonometry in engineering problem solving encompassing:

- Problems using the six trigonometrical ratios
- Problems involving compass bearings and angles of elevation/depression
- Trigonometrical concepts in problems involving inclined planes, vectors and forces and electrical sinusoidal waveforms

T4 Sine and cosine rules in practical applications encompassing:

- Sine rule to solve unknown dimensions/angles in triangles
- Cosine rule to solve unknown dimensions/angles in triangles

T5 Mathematical concepts in basic surveying and computation of areas encompassing:

- Mathematical concepts for radial and triangulation surveys
- Simpson's Rule in engineering applications

T6 Basic algebra in engineering calculations encompassing:

- Basic operations involving substitutions, additions, removal of brackets, multiplication and divisions
- Solving linear equations
- Transportation in non-linear equations

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REQUIRED SKILLS AND KNOWLEDGE

T7 Linear graphical techniques in engineering problem solving encompassing:

- Graphing linear functions
- Deriving equations from graphs and tables
- Solving simulations equations algebraically and graphically
- The best line of fit graphically and determine equation

T8 Mathematical computations involving polynomials encompassing:

- Adding, subtracting and multiplying polynomials
- Factorising trinomials
- Solving quadratic equation

T9 Mathematical computations involving quadratic graphs encompassing:

- Graphs of quadratic functions
- Maxima and minima
- Graphical solutions of quadratic equations
- Properties of a parabola
- Applications of parabolas in engineering applications

T10 Trigonometry and graphical techniques in engineering outcomes encompassing:

- Graphs of trigonometric functions e.g.: $V=V_m\sin\theta, I=I_m\cos\theta$
- Addition of equations such as: $v\sin\theta + u\sin(\theta + \phi)$ graphically
- Simpson's Rule to determine the average and root mean square values of a sinusoidal waveform

T11 Statistical data presentation encompassing:

- Appropriate presentation of frequency tables, histograms, polygons, stem and leaf plots
- Advantages of different visual presentations

T12 Appropriate sampling techniques for gathering data encompassing:

- Design of surveys and census
- Sample data using correct technique

T13 Use of the measures of central tendency encompassing:

- Estimation of percentiles and deciles from cumulative frequency polygons (ogives)
- Interpreting data from tables and graphs including interpolation and extrapolation
- Analysing misleading graphs

T14 Measures of dispersion in statistical presentations encompassing:

- Box-and-whisker graphs
- Measures of dispersion using variance and standard deviation
- Standardised scores including Z-scores

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REQUIRED SKILLS AND KNOWLEDGE

T15 Correlation and regression techniques encompassing:

- Interpreting scatter plots
- Correlation coefficients
- Calculate the regression equation and use for prediction purposes

T16 Elementary probability theory encompassing:

- Probabilities in everyday situations
- Counting techniques: factorials; permutations; combinations

T17 Paschal's Triangle and the Normal Curve encompassing:

- Paschal's triangle
- Characteristics of the normal curve
- Standard Deviation and applications to everyday occurrences
- Probabilities using the normal curve

T18 Differential Calculus encompassing:

- Basic concepts - definition of the derivative of a function as the slope of a tangent line (the gradient of a curve); limits; basic examples from 1st principles; Notation and Results of derivative of k.f(ax + b) where f(x)=x to the power of n, sin x, cos x, tan x, e to the power of x, ln x.
- Rules - derivative of sum and difference; product rule; quotient rule; chain rule (function of a function), limited to two rules for any given function.
- The 2nd derivative
- Application - equations of tangents and normals; stationary points; turning points; and curve sketching; rates of change; rectilinear motion
- Verbally formulated problems involving related rates and maxima: minima

T19 Integral Calculus encompassing:

- Integration as the inverse operation to differentiation - results of the integral of k.f(ax + b) where f(x) = x to the power of n, sin x, cos x, sec squared x, e to the power of x
- The method of substitution
- The definite integral
- Applications - areas between curves; rectilinear motion including displacement from acceleration and distance travelled; voltage and current relationship in capacitors and inductors and the like

T20 Differential Equations encompassing:

- First order and separable linear equations

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Evidence Guide

EVIDENCE GUIDE

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The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Undertake computations in an energy sector environment as described in 8) and including:

A Understanding transporting instructions.

B Checking transport details against job instruction.

C Obtaining relevant plant and equipment.

D Transporting plant and equipment in accordance

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with requirements.

E Undertaking computations in accordance with requirements.

F Notifying work completing.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to undertaking computations in an energy sector environment.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to undertaking computations in an energy sector environment in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE151A Transport apparatus, equipment and materials

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers transport apparatus, plant accessories and materials. It encompasses safe working practices and following work processes that satisfy electrical principles for transporting apparatus and materials.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control,

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License to practice **3)**

lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Plan and prepare for the transport of apparatus and materials.	1.1	Transport of apparatus and materials is planned and prepared to ensure OHS policies and procedures are followed, the work is appropriately sequenced in accordance with requirements.
	1.2	Appropriate personnel are consulted to ensure apparatus; accessories, plant, equipment and/or materials are appropriately identified, and checked against manufacturer transport instructions and requirements.
	1.3	Transport details of apparatus and materials are checked against job requirements.
	1.4	Plant needed to carry out the work is obtained in accordance with established procedures and checked for correct operation and safety.
	1.5	Where appropriate, team and individual work roles and responsibilities within the team are identified.
	1.6	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2 Transport apparatus and materials.	2.1	OHS policies and procedures for the transport of apparatus plant and materials are followed.
	2.2	Apparatus, plant and materials are transported in accordance with requirements, and manufacturer transport instructions without damage or distortion to the surrounding environment or services.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Unplanned events or conditions are responded to in accordance with established procedure.
	2.4	Approval is obtained in accordance with established procedures from appropriate personnel before any contingencies are implemented.
	2.5	Ongoing checks of the work quality are undertaken in accordance with established procedures.
3 Check and notify completion of work.	3.1	Final inspections are undertaken to ensure the transported apparatus and materials conforms to requirements.
	3.2	Work completion is notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and transporting energy sector apparatus and materials.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE151A Energy sector apparatus and materials transport

Evidence shall show an understanding of energy sector apparatus and materials transport to an extent indicted by the following aspects:

T1 Energy sector apparatus encompassing:

- Types of apparatus used in the electrotechnology, ESI and gas industry

T2 Energy sector materials encompassing:

- Types of materials used in the electrotechnology, ESI and gas industry
- OH&S requirement

T3 Energy sector transport encompassing:

- Types of transport used in the electrotechnology, ESI and gas industry
- Manual handling techniques

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best

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utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline,

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work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Transport apparatus and materials as described in 8) and including:

A	Transporting apparatus.
B	Transporting equipment.
C	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

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- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to transporting apparatus and materials.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to transporting apparatus and equipment in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE152A Observe safety practices are followed in the vicinity of isolated electrical cables

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the observation of the safe work methods in the vicinity of isolated cables/conductors designed to operate above extra-low voltage. It requires an understanding of a 'permit-to-work' system, electrical hazards, consequences of damage to cables and electrical infrastructure, and safe working methods, identifying hazards, evaluating risks and adapting safe work methods, observing and supervising the safe working behaviour of the work being undertaken and document safety activities

Application of the Unit

Application of the Unit **2)**

This unit augments other formally-acquired competencies in a relevant industry such as in construction, maintenance or repair function or plant or machinery operation at least at AQF 2 and shall be used only in conjunction such competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit does require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to

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License to practice **3)**

regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to observe safety practices.	1.1	Instructions on the nature of the work to be undertaken are received and understood
	1.2	Location of electrical cables in the vicinity of the work to be undertaken is received from person of higher authority
	1.3	Access permit is sought from an authorised switching officer and received, read and understood after the electrical supply to cables in the vicinity of the work to be undertaken is isolated.
	1.4	Safe working methods for plant, machinery and equipment to be used is reviewed and understood.
2 Observe safety practices	2.1	Work is observed to ensure safe working methods are followed.
	2.2	Work within the vicinity of isolated electrical cables is observed to ensure they are not damaged or disturbed.
	2.3	Unplanned events are dealt with in accordance with established procedures.
3 Take actions to mitigate risk	3.1	Work is stopped when a hazard arises that has not been previously identified
	3.2	Newly identified hazards are referred to appropriate personnel for developing risk mitigation measures in accordance with establish consultation process.

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Risk mitigation measures are monitored for continuous improvement in accordance with established procedures.
	3.4	Observations of safe working practices and any corrective actions are documented in accordance with establish consultation process.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and the application of the safe work methods in the vicinity of isolated cables/conductors designed to operate above extra-low voltage.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EE152A Safety practices - electrical cables and infrastructure

Evidence shall show an understanding of working safely around electrical infrastructure to an extent indicted by the following aspects:

T1 Effects of electric shock on the human body encompassing:

- Shock currents
- Burns
- Risks of low voltage, high voltage and high currents

T2 Risk management and assessment of risk encompassing:

- Principle and purpose of risk management, and
- Processes for conducting a risk assessment

T3 Hazards associated with electrical cables/conductors encompassing:

- Electrical supply arrangements for isolation of circuits
- Supply connected.
- Capacitance charge on cables isolated from supply.

T4 Consequences of damaged cables/conductors encompassing:

- Accelerated deterioration of insulated cables (Includes damage to enclosures, serving, armours, sheathing and insulation without exposure of the conductors)
- Damage exposing conductors with the likelihood of dangerous step voltage and touch voltage'.
- How an short-circuit occurs and the resulting potential damage they cause.

T5 Risks and control measures associated with work in the vicinity of electrical cables and infrastructure.

T6 The main features and purpose of an access permit system.

T7 Electrical isolation and types of permits issued for work in the vicinity of isolated cables.

T8 Scope of work permitted on an access permit.

T9 Safety observation procedures.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are

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included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Observing that safety practices are followed in the vicinity of isolated electrical cables as described in 8) and including:

A Reading instructions and understanding the nature of the work to be undertaken.

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B	Understanding the location electrical cables in the vicinity of the work to be undertaken
C	Receiving, reading and understanding access permit.
D	Reviewing and understanding safe working methods for the plant, machinery and equipment to be used.
E	Observing work activities ensuring safe working methods are followed.
F	Dealing with previously unidentified hazards in accordance with established procedures.
G	Monitoring risk mitigation methods for continuous improvement in accordance with established procedures.
H	Documenting safe working practices and any corrective actions in accordance with established procedures.
I	Dealing effectively with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to the application of the safe work methods in the vicinity of isolated cables/conductors designed to operate above extra-low voltage.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given industry or enterprise construction, maintenance or repair function or plant or machinery operation.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to observing that safety practices are followed in the vicinity of isolated electrical cables that normal operate above extra-low voltage in each of the following situations:

- Cables installed underground in ducts or buried direct
- Bare and insulated overhead conductors/cables
- Cables installed above ground, unenclosed or enclosed in conduit, trunking or duct.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE160A Provide engineering solutions for uses of materials and thermodynamic effects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the engineering solution for the appropriate selection and use of materials and thermodynamic effects relative to an electrotechnology problem. It encompasses working safely, problem solving procedures, including using measuring instruments, applying appropriate theorems and providing solutions derived from measurements and calculations and justification for such solutions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 6. It may also be suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the

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License to practice **3)**

characteristics and behaviour of material in an engineering environment.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide solutions for the uses of materials and thermodynamics.	1.1	OHS procedures for a given work area are obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of equipment and products that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices necessary for the work are obtained and checked for correct operation and safety.
2 Provide solutions for the uses of materials and thermodynamics.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure active systems is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Systems are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Established methods are used to solve system problems from measure and calculated values,

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ELEMENT	PERFORMANCE CRITERIA	
		as they apply to materials and thermodynamics.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices with the minimum waste and rework.
3 Complete work and document solutions to discovered problem.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve system problems is documented.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing solutions for uses of materials and thermodynamic effects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE160A Material science and thermodynamics

Evidence shall show an understanding of materials and there characteristics and thermodynamics to an extent indicated by the following aspects:

T1 Classification of materials on the basis of state

T2 Difference between elements, compounds and mixtures

T3 Atomic structure and bonding of materials

T4 Properties of ferrous and non-ferrous materials

T5 Properties of ceramic and composite materials

T6 Chemical, physical and mechanical properties of materials

T7 Corrosion and corrosion protection of metallic structures and systems

T8 Causes of degradation of polymer materials

T9 Non-destructive testing and types of test equipment

T10 Corrosion testing

T11 Evaluation and suitability of materials for specific applications

T12 Principles, advantages and limitations of casting, forging, extrusion and powder metallurgical processes

T13 Methods of joining materials, including limitations

T14 Methods used for surface finishing of materials, including limitations

T15 Relationship between energy usage and standard of living

T16 Energy conversion and conversion efficiencies

T17 Energy sources and there advantage in engineering processes

T18 Energy conservation

T19 State of matter in terms of molecular theory

T20 Relationship between mass, volume, density, force, pressure and temperature in thermodynamic concepts

T21 Compression ratio and pressure ration calculations in a basic piston and cylinder mechanism

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REQUIRED SKILLS AND KNOWLEDGE

T22 Concepts, theorems and calculations related to potential energy, kinetic energy, work and powered, heat and internal energy of object.

T23 Relationship between work and pressure/volume

T24 Concept and calculations related to energy transfer in a closed loop system

T25 Concept of and calculations about property changes and work, heat and internal energy transfer in gases in typical engineering processes

T26 Principle, operation and performance of common types of heat engines

T27 Heat engine performance parameters and typical performance tests

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

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  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide solutions for uses of materials and thermodynamic effects as described in 8) and including:

A Determining the characteristics and application of materials and the effects of thermodynamics.

B Using established problem solving methods.

C Taking relevant measurements accurately.

D Interpreting measured values appropriately.

E Providing effective solutions to system problems from measurements and calculations.

F Giving written justification of solutions provided.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the

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approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing solutions for uses of materials and thermodynamic effects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to analysing materials and thermodynamic effects relative to two different engineering applications.

Note.

Typical engineering applications are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE161A Analyse static and dynamic parameters of electrical equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the analysis of static and dynamic parameters of electrical equipment associated with plant and machinery. It encompasses working safely, applying extensive knowledge of equipment operation and construction and its application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical machine problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 6.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to analyse static and dynamic parameters of machinery.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the machine analysis is determined from performance specifications and situation reports and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Strategies are identified to ensure efficient development and implementation of solution(s).
2 Analyse static and dynamic parameters of machinery.	2.1	OHS risk control work measures and procedures for carrying out the work are followed.
	2.2	Knowledge of statics and dynamics are applied to developing analytical solutions to machine parameters.
	2.3	Parameters, specifications and performance requirements in relation to each machine analysed are obtained in accordance with established procedures.
	2.4	Approaches to analysing machine parameters are carried out so as to provide the most effective

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ELEMENT	PERFORMANCE CRITERIA	
		solution.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Document and report the results of the analysis of static and dynamic parameters of machines.	3.1	Solutions to machine analysis are tested to determine their effectiveness and modified where necessary.
	3.2	Analysis is documented including details of all findings, calculations and assumptions.
	3.3	Analysis is reported to appropriate personnel to establish action to be taken based on findings.
	3.4	Justification for findings, and any actions to be undertaken in relation to the equipment, is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and analysing static and dynamic parameters of equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE161A Statics and dynamics

Evidence shall show an understanding of statics and dynamics to an extent indicated by the following aspects:

T1 Units of mass, length, time and force and distinguish between vector and scalar quantities

T2 Resultant and equilibrant of systems of coplanar concurrent and non-concurrent forces

T3 Principles of movement

T4 Reactions of structures using equations of equilibrium and including the moment effect of a couple

T5 Laws of dry sliding friction applicable to horizontal and inclined planes

T6 Reactions and internal forces acting on the members of a pin jointed framed structure subjected to point loads at the joint

T7 Pin and support reactions for a non-complanar non-concurrent force system

T8 Linear and angular equations of motion for constant accelerations

T9 Principles of the conservation of energy

T10 Mechanical advantage, velocity ratio and efficiency of machines

T11 Acceleration experienced by connected bodies so there motions are dependent upon one another

T12 Principle of conversion of moment related to elastic collisions and departure masses

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse static and dynamic parameters of equipment as described in 8) and including:

A	Understanding the operation of machines.
B	Forming effective strategies for analysing machine performance.
C	Obtaining machine parameters, specifications and performance requirements appropriate to each situation.

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D	Testing the results of the analysis.
E	Documenting instruction for implementing any actions resulting from the analysis that incorporates risk control measure to be followed.
F	Documenting justification of actions to be implemented in accordance with professional standards.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to analysing static and dynamic parameters of equipment.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to analysing static and dynamic parameters on at least two different types of machine.

Note.

Typical machines are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE162A Select drive components for electrical equipment design

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the selection of drive components based on design concepts for the operation of plant and electrical equipment. It encompasses working safely, applying extensive knowledge of drive component operation and characteristics, their application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical drive components are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Application of the Unit

Application of the Unit

2)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 6 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability

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Employability Skills	**5)** Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to select drive components.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the drive selection is determined from performance specifications and situation reports and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Strategies are identified to ensure efficient development and implementation of solution(s).
2 Select drive components	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of drive components is applied to engineering design concepts.
	2.3	Parameters, specifications and performance requirements in relation to drive components are established in accordance with established

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ELEMENT	PERFORMANCE CRITERIA	
		procedures.
	2.4	Drive components are selected to provide the most effective solution(s).
	2.5	Unplanned events are dealt with safely and effectively and consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Document and report the results of the selection of drive components relative to engineering design concepts.	3.1	Selection of drive components is tested to determine their effectiveness and modified where necessary.
	3.2	Selection is documented including details of all findings, calculations and assumptions.
	3.3	Selection is reported to appropriate personnel to establish action to be taken based on findings.
	3.4	Justification for selection and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and selecting drive components for equipment design.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE162A Mechanical drives engineering

Evidence shall show an understanding of mechanical drive components and engineering design concepts to an extent indicated by the following aspects:

T1 Function of common mechanical drive parts and components

T2 Australian Standards governing the design of parts and components in a drive system

T3 Selection criteria for a part or component or drive system to suit a particular application

T4 Design philosophy applicable to mechanical, civil and electrical engineering

T5 Essential features of a design specification

T6 Understanding of Australian Standards and Codes of practice for design

T7 Steps in a designing a design

T8 Ergonomics in design

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment,

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such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

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- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Selecting drive components for equipment design as described in 8) and including:

A	Understanding drive components relative to engineering design concepts.
B	Forming effective strategies for selecting drive components.
C	Obtaining drive component parameters, specifications and performance requirements appropriate to each situation.
D	Testing the results of the selection.
E	Documenting instruction for implementing any actions resulting from the selection that incorporates risk control measure to be followed.
F	Documenting justification of actions to be implemented in accordance with professional standards.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used

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to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to selecting drive components for equipment design.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE163A Analyse materials for suitability in equipment

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to selection of two different types of drive components.

Note.

Typical drive components are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with mechanical drive malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE163A Analyse materials for suitability in electrical equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the analysis of materials for their suitable use in the construction of electrical equipment. It encompasses working safely apply extensive knowledge of materials and their properties as they relate to equipment construction and operation, gathering and analysing data, applying problem solving techniques, developing and documenting findings, solutions and providing alternatives.

Note.

Typical machine problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 6.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not

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License to practice **3)**

require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of

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Employability Skills	**5)** competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to analyse materials.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the machine analysis is determined from performance specifications and situation reports and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Strategies are identified to ensure efficient development and implementation of solution(s).
2 Analyse materials.	2.1	OHS risk control work measures and procedures for carrying out the work are followed.
	2.2	Knowledge of materials is applied to developing machine parts.
	2.3	Characteristics, specifications and performance requirements in relation to materials are obtained

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ELEMENT	PERFORMANCE CRITERIA	
		in accordance with established procedures.
	2.4	Approaches to analysing materials are carried out so as to provide the most effective solution.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Document and report the results of the materials analysis.	3.1	Solutions to materials analysis are tested to determine their effectiveness and modified where necessary.
	3.2	Analysis is reported to appropriate personnel to establish action to be taken based on findings.
	3.3	Analysis is reported to appropriate personnel to establish action to be taken based on findings.
	3.4	Justification for findings and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and analysing materials for suitability in equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE163A Materials and strengths of materials

Evidence shall show an understanding of materials used in engineering and the mechanical properties of these materials to an extent indicated by the following aspects:

T1 Structure of metals, polymers and ceramics

T2 Interpretation of phase equilibrium and isothermal transformation diagrams

T3 Heat treatment processes of low carbon steel, high carbon steel and tool steel as well as non-ferrous metals such as aluminium and copper

T4 Properties and specifications of metal and non-metal materials

T5 Common failures in materials

T6 Determining normal stresses, strains and deformations caused by axial load

T7 Sheer stress on bolted connections

T8 Failures in fillet welds and determine appropriate weld size and length required on welded connections

T9 Centroid and second moment of gyration of plain figures

T10 Sheer force and bending moment diagrams for supported and cantilever beams subjected to vertical point loads and UDLs

T11 Bending stress in beams

T12 Deflection of beams subjected to loads

T13 Torque distribution diagrams and calculation of torsional sheer stress and angle of twist on circular shafts subjected to torque

T14 Coefficient of linear expansion to determine thermal stress in single members caused by restrain and changes in temperature

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse materials for suitability in equipment as described in 8) and including:

A	Understanding the material properties.
B	Forming effective strategies for analysing machine performance.
C	Obtaining machine characteristics, specifications and performance requirements appropriate to each situation.

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D	Testing the results of the analysis.
E	Documenting instruction for implementing any actions resulting from the analysis that incorporates risk control measure to be followed.
F	Documenting justification of actions to be implemented in accordance with professional standards.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to analysing materials for suitability in equipment.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE162A	Select drive components for electrical equipment design

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to analysing four (4) different types of materials.

Note.

Typical materials are those encountered in meeting performance requirements and compliance standards, characteristics and operating parameters.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE164A Design electrical machine drives and production layout plans

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the design of electrical machine drives and the layout of machinery for the efficient production of goods produced by automated equipment. It encompasses working safely, applying extensive knowledge of machine drives and equipment layout arrangements, their application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical machine drives and production layout plans are those encountered in meeting performance requirements and compliance standards, production requirements and efficient use of materials and human resources.

Application of the Unit

Application of the Unit

2)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 6.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not

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License to practice **3)**

require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE161A	Analyse static and dynamic parameters of electrical equipment
UEENEEE162A	Select drive components for electrical equipment design
UEENEEE163A	Analyse materials for suitability in electrical equipment
UEENEEE126A	Provide computational solutions to basic engineering problems
UEENEEE129A	Solve electrotechnical engineering problems

OR

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG1	Solve problems in electromagnetic devices

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Prerequisite Unit(s) **4)**

01A	and related circuits
OR	
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
AND	
UEENEEE104A	Solve problems in d.c. circuits
OR	
UEENEEH169A	Solve problems in basic electronic circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design machines and production layout plans.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the machine design and production layout plans are determined from performance specifications and situation reports and in consultation with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Strategies are identified to ensure efficient development and implementation of solution(s).
2 Design machines and production layout plans	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of machine designs and production layout plans is applied to engineering design concepts.
	2.3	Parameters, specifications and performance requirements in relation to machine design and production layout plan are established in accordance with established procedures.
	2.4	Approaches to selecting machine designs and production layout plans are carried out so as to

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ELEMENT	PERFORMANCE CRITERIA	
		provide the most effective solution.
	2.5	Unplanned events are dealt with safely and effectively and consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3 Document and report the results of the machine design and production layout plans relative to engineering design concepts.	3.1	Machine design and production layout plan is tested to determine their effectiveness and modified where necessary.
	3.2	Design and layout is documented including details of all findings, calculations and assumptions.
	3.3	Design and layout is reported to appropriate personnel to establish action to be taken based on findings.
	3.4	Justification for design and layout and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing machine drives and production layout plans.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE164A Machine design and positioning

Evidence shall show an understanding of the design parameters of machines and there capability as well as the ability to redesign their operating performance as well as the location of machines in and assembly or manufacturing environment to maximise production efficiency to an extent indicated by the following aspects:

T1 Materials used in machine drive shafts

T2 Standard formulas and specifications to determine machine drive shaft sizes for power, deflection, torque, bending data, key sizes, spline size and pin size

T3 Selection of power prime movers from manufacturers catalogues

T4 Principles associated with systematic planning of material flow in a production process

T5 Adaptation of systematic layout planning to a production process

T6 Preparation of process layouts and materials flow patterns in a production process

T7 Materials handling methods and unit load concepts

T8 Types of materials handling systems

T9 Design of materials handling systems and the factors that guide the final selection of a system

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design machine drives and production layout plans as described in 8) and including:

A	Understanding machine design and production layout issue relative to engineering design concepts.
B	Forming effective strategies for machine designs and plant layout.
C	Obtaining parameters, specifications and performance

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requirements appropriate to each situation.

D	Testing the results of the design and/or layout.
E	Documenting instruction for implementing any actions resulting from the design and layout that incorporate risk control measure to be followed.
F	Documenting justification of actions to be implemented in accordance with professional standards.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing machine drives and production layout plans.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to selection of two different types of machine design and two different production layout plans.

Note.

Typical machine designs and production layout plans are those encountered in meeting performance requirements and compliance standards, the initial design or revising a machine operating parameters and dealing with efficient production processes.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE179A Identify and select components, accessories and materials for energy sector work activities

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers undertaking a schedule of work for selecting appropriately identified components, accessories or materials in an agreed time, to a quality standard and with a minimum of waste, using appropriate technology mediums where required.

Application of the Unit

Application of the Unit

2)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and

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Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, and power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit has been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE148A	Carry out routine work activities in an energy sector environment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to identify components, accessories and materials.	1.1	Instructions for preparing components, accessories or materials identification is communicated and confirmed to ensure clear understanding.
	1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply in the carrying out of the work.
	1.3	Necessary tools, equipment and personnel protective equipment are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
	1.5	Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures.
	1.6	Schedule(s) for identifying components, accessories or materials including practices for working safely are confirmed in accordance with instructions and requirements.
2 Select components, accessories and materials.	2.1	OHS policies and procedures and safe work practices are followed.
	2.2	Schedule for selecting components, accessories or materials are followed to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste, using

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ELEMENT	PERFORMANCE CRITERIA	
		appropriate technology.
	2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
	2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3 Confirm selection of components, accessories and materials.	3.1	Final checks are made to ensure selection of components, accessories or materials conforms to instructions.
	3.2	Appropriate personnel are notified of completion of the selection process.
	3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
	3.5	Appropriate records are updated in accordance with instructions and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and identifying and selecting components/accessories/materials for energy sector work activities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE179A Parts and components selection

Evidence shall show an understanding of electrotechnology, parts and component selection to an extent indicated by the following aspects:

T1 Part and component identification encompassing:

- Type, number and ratings of a range of typical components used in the electrotechnology and engineering industries

T2 Information about parts and components encompassing:

- Catalogues
- Computer access
- Alternative parts
- Telephone inquiry

Note: Examples of part identification and access may include: part codes, manufacturers and price, including manufacturers supply outlets; availability and delivery times; discounts, tax and delivery costs.

T3 Ordering procedures encompassing:

- Customer approval
- Supplier requirements
- In-house requirements

T4 Receiving/dispatching procedures

- Supplier requirements
- In-house requirements
- Handling and storage

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Identify and select components/accessories/materials for energy sector work activities as described in 8) and including:

A	Understanding work instruction.
B	Obtaining and checking tools and equipment.
C	Following work schedules.

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D	Returning tools and surplus resources as required.
E	Updating work records.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to identifying and selecting components/accessories/materials for energy sector work activities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended

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for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE148A	Carry out routine work activities in an energy sector environment

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to identifying and selecting components/accessories/materials for energy sector work activities in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy, and
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.2

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE185A Write work activity reports

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers writing reports related to installation, fault finding, servicing/maintenance and safety in an energy sector discipline. It encompasses a relevant level of understanding of the energy sector discipline subject to the reports, gathering relevant information from appropriate sources; make deductions from the information obtained, arranging reports in a logical sequence and writing in clear English.

Application of the Unit

Application of the Unit

2)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be

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undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop a report.	1.1	The need for a report is determined from particular circumstances and /or request in accordance with established procedures
	1.2	The purpose and scope of the report is ascertained from the particular circumstances and /or request in accordance with established

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ELEMENT	PERFORMANCE CRITERIA	
		procedures.
	1.3	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.4	Sources of information needed for the report are identified and obtained in consultation with appropriate persons and in accordance with established procedures.
2 Write report.	2.1	Report is developed in consultation with appropriate persons.
	2.2	Report is developed to include all relevant information obtained
	2.3	Information in the report is arranged in a logical sequence including deductions recommendations where appropriate.
	2.4	Report is written in clear English and in accordance with organisation policies and procedures.
3 Obtain approval for final report.	3.1	Report is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the report resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Final report is presented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and writing a work activity report.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG185A Work activity reporting

Evidence shall show an understanding of work activity reporting to an extent indicated by the following aspects:

T1 Scope of work activity reports encompassing:

- Installation, fault finding/repair, servicing/maintenance and safety work activities.
- Reports in response to an enquiry, situation, investigation, problem and incident.

T2 Sources of information

- Examples include (but not limited to) work colleagues, customer/client personnel, standards, specifications and direct experience of the enquiry, situation, investigation, problem or incident that is subject of the report

T3 Structure of reports encompassing:

- The description and/or explanation of the subject matter in logical sequence of facts
- Arrangement of content

T4 Clear English writing techniques

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Compile and produce an electrotechnology report as described in 8) and including:

A	Determining the need for a report
B	Ascertaining the purpose and scope of a report
C	Sources and obtain information relevant to a report
D	Including all relevant information

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E	Arranging reports in a logical sequence
F	Writing reports in plain English
G	Obtaining approval for the report
H	Dealing with unplanned events

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to compiling and producing an electrotechnology report.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

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Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to writing reports in response to at least three of the following:

- an enquiry,
- a situation,
- an investigation,
- a problem or
- an incident

Each in relation to a different one of the following work activities:

- installation,
- fault finding/repair,
- servicing/maintenance or
- safety

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE190A Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the preparation of, and modification of, preliminary engineering drawings for electrotechnology/ utilities applications using manual drafting methods and computer-aided design (CAD) equipment and software from specifications, layouts, sketches or verbal instructions in conformance with Australian Standards and enterprise standards.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEED104A	Use software for engineering applications
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to produce electrotechnology/utilities engineering drawings	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures in preparation for the work are followed
		1.3	The extent of the work is determined from project specifications and discussion with appropriate personnel
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
		1.5	Software tools and equipment a needed for the work are obtained in accordance with established procedures
2	Produce electrotechnology/utilities engineering drawings	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	The types of design drawings and layouts required are determined from project specifications
		2.3	Technical data of system components is interpreted to determine parameters that are to be included in the drawings
		2.4	Appropriate software tools are used to produce drawing based on standard protocols
		2.5	Drawings are checked for accuracy are compliance with project specifications
		2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work

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ELEMENT	PERFORMANCE CRITERIA	
		outcomes.
3 Complete and report electrotechnology/utilities engineering drawings	3.1	Completed drawings are submitted to an appropriate person to be checking for accuracy and compliance with project specifications.
	3.2	Any alterations, additions or correction instructions are followed and drawings are re-submitted for final approval
	3.3	Copies of completed drawings are filed securely in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and methods used to prepare electrotechnology/utilities engineering drawings using manual drafting and CAD applications.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE190A Electrotech/utilities engineering drawings and diagrams

Evidence shall show an understanding of electrotech/utilities engineering drawings and diagrams to an extent indicated by the following aspects

T1 Drawing fundamentals encompassing:

- principles, purpose and classification of drawings
- basic drawing terms and conventions
- symbols, codes and abbreviations used in drafting drawings
- tools and equipment used in drafting drawings
- drawing forms; sheet size and format, metric, imperial, copy fold information
- drawing routines; signatures, approvals, dates, numbers and numbering systems, design considerations/specifications, materials or component specifications, lists, titles, proprietary information, fasteners, representations, notes, charts and graphs, modifications and revision conventions
- fundamentals of drafting documentation including contents, version control, indexing and product identification (e.g. logo, trademark, software warning plates)
- delineation; line conventions and lettering, multi- and sectional view drawings, pictorial drawings, types and application of engineering drawings, conventional representations, microfilming, descriptive geometry and revolutions
- measurements; types, forms, units, symbols, reading and transfer
- sketching techniques (e.g. freehand lettering)
- basic drafting skills (e.g. drafting by hand, working with triangles, and working with a T square)
- basic drawing layout (e.g. borders and information blocks)
- line types and weights
- geometric construction principles
- use of drawing instruments and equipment to produce basic technical drawings
- drawings instruments and media usage
- usage of reproducible drawings with mechanical pencils

T2 Lettering encompassing:

- principles, concepts and applications of lettering

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REQUIRED SKILLS AND KNOWLEDGE

- terms, conventions and codes related to lettering
- construction of vertical or inclined, single-stroke Gothic lettering, numerals, and fractions, including proper spacing and guidelines
- proper lettering instruments selection
- usage of lettering techniques for notes and titles on drawings
- text style, text composition, and text placement selection and application

T3 Sketching encompassing:

- principals, practices and rules for sketching in relation to proportion, placement of the views, and drawing medium
- concepts and applications of sketching
- terms, conventions and codes related to sketching
- sketches used in industry
- usage of sketching aids for creative communication
- sketching types and their applications
- line techniques in sketching simple objects
- estimation and proportion techniques usage
- views selection for requisite applications
- blocking technique for size, shape, and details
- surface shading techniques

T4 Geometric construction encompassing:

- principles, concepts and applications of geometric construction
- terms, conventions and shapes related to geometric construction
- drawing techniques of lines, angles, circles, arcs, tangents, and polygons
- geometric construction to single-view and multi-view drawings
- graphic geometric controls
- intermediate CAD commands
- plotting and printing equipment set up and configuration

T5 Multi-view orthographic projections Australian/New Zealand and industry standards encompassing:

- principals of multi-view orthographic projections
- terms, conventions and codes related to multi-view drawings
- applications and use of orthographic projections/drawings (e.g. 3rd angle)
- types and usage techniques of orthographic projection
- sketching techniques related to orthographic views
- rules for orthographic projection
- working drawing problems and specifications
- views visualisation and selection
- 1st and 3rd angle projection drawings
- lines, lettering, and drawing medium types

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REQUIRED SKILLS AND KNOWLEDGE

- fractional, decimal, and metric equations solutions
- concepts of units of measurement usage related to multi-view orthographic projections
- sectional and/or auxiliary views uses, identification and analysis
- rules for sections and auxiliary views
- geometric figures visualisation and drawing in two dimensions
- geometric figures classification and comparison
- circle properties and relationships, and circle problem solving
- drawing from a view of a model (e.g. orthographic projection)

T6 Auxiliary views encompassing:

- principles, terms and conventions usage in auxiliary views
- use and application of auxiliary views
- primary auxiliary view construction
- secondary auxiliary view construction

T7 Descriptive geometry/revolutions encompassing:

- principles, terms and conventions usage in descriptive geometry/revolutions
- graphic solutions of points, lines, and planes
- graphic solutions of intersections (e.g. lines, planes, and solids)
- true length of lines, bearing, and slope of lines
- graphic solutions of solids
- drawings construction using the revolution method

T8 Sectional views/conventions encompassing:

- principles, terms, symbols and conventions of sectional views
- use and application of sectional views
- drawing standard sectional views
- use of conventional breaks
- symbols used to represent different materials
- use of cutting plans

T9 Pictorial drawings introduction and production to Australian/New Zealand and industry standards encompassing:

- principals, concepts and applications of pictorial drawings
- terms, symbols, conventions and codes usage in pictorial drawings
- types and usage techniques of pictorial drawings
- line of sight application
- isometric view usage
- pictorial drawing types usage and selection
- pictorial drawings sketching
- pictorial working drawing problems and specifications
- axonometric, oblique, and perspective drawings construction

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REQUIRED SKILLS AND KNOWLEDGE

- calculations in projection plane angles
- standards for drawing pictorial drawings
- application of properties and relationships of triangles to solve geometric shapes
- conversion of an angular dimension of an orthographic to a linear dimension in a pictorial drawing
- drawing techniques of pictorial representations

T10 Dimensioning/size description and tolerancing as applied to drafting encompassing:

- principles, terms, symbols and conventions used in dimensioning and tolerancing
- terms, conventions and codes related to dimensioning
- dimensioning drawing construction using Australian/New Zealand standards
- types and usage techniques of dimensioning
- application of dimensioning to object drawings
- geometric dimensioning and tolerancing
- lines used in dimension drawings construction
- dimensioning practices applications
- dual dimensioning
- tolerancing applications
- dimensioning verification requirements
- formulas for positional tolerancing
- form, orientation, profile and runout

T11 Development layouts of various shaped objects to Australian/New Zealand and industry standards encompassing:

- principals and concepts of development layouts of various shaped objects
- terms, conventions and codes related to surface developments
- surface developments uses in Australian/New Zealand and industry standards
- basic three dimensional geometric shapes visualisation in a two dimensional plane
- cut out and construct models for checking accuracy
- rules to surface developments to produce stretchouts

T12 Layout drawings production to Australian/New Zealand and industry standards encompassing:

- principals, concepts and applications of layout drawings
- terms, conventions and codes related to layout drawings
- layout drawings types and differences
- rules for layout drawings
- concepts of units of measurement usage related to layout drawings

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REQUIRED SKILLS AND KNOWLEDGE

T13 Technical illustrations drawing to Australian/New Zealand and industry standards encompassing:

- principals, concepts and purpose of technical illustrations
- terms, conventions, symbols and codes related to technical illustrations
- types and usage techniques of illustrations
- rules for technical illustration application
- techniques and applications for creating illustrations
- illustration types usage and selection
- illustration working drawing problems and specifications
- techniques and applications in the use of drawing instruments to prepare illustrations
- surface shading purpose and types, selection and analysis
- techniques and applications in airbrush renderings to detailed illustrations
- techniques and applications of CAD practices to technical illustrations
- techniques and applications of line-shaded illustrations
- concepts of units of measurement usage related to illustrations
- solutions for illustrations using fractional, metric, and decimal equations

T14 Graphs and charts production to Australian/New Zealand and industry standards encompassing:

- principals, concepts and applications of basic graphs, charts and diagrams production
- terms, conventions and codes related to basic graphs, charts and diagrams production
- graphs, charts and diagrams production types, usage and variations
- data configuration for graphic representation
- graph type selection per specifications and data
- basic graphic charts and diagrams interpretation
- charts and diagrams construction

T15 Thread representations encompassing:

- principles, concepts and applications of threaded fasteners
- terms, conventions and codes related to threaded fasteners
- types and usage techniques of threaded fasteners
- drawing of threads using simplified and schematic types of thread representation

T16 Working drawings encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- principles, concepts and applications of working drawings
- terms, conventions and codes related to working drawings
- types and usage techniques of working drawings
- title block, bill of materials, and schedules used in working drawings
- working drawing production requirements

T17 Care and use of equipment encompassing:

- principles, concepts and applications of various drafting instruments, equipment, and materials
- types and usage techniques of drafting instruments, equipment, and materials
- drawing materials selection for specific types of drafting projects
- drawing instruments usage as a means of technical drawings preparation for accuracy, and readability
- Computer Aided Design (CAD) station components identification
- CAD setup requirements to complete a basic drafting problem

T18 Computer-aided drawing design (CAD) - basics encompassing:

- principles, terms, symbols and conventions usage in computer-aided drawing design (CAD)
- concepts and applications of CAD and related application commands
- types of CAD hardware
- CAD standards encompassing: file presentation; layering standards - sorting graphic data including data groups, principal data, supporting data, layering naming convention, colour assignment standard (layer colours and pen weights), provision for creation of new layers; blocks standards - real blocks object, common block objects, symbol objects, block library, block naming; text style standards - text styles naming, text height; dimension styles standards - dimension style naming; linetype standards; title blocks and graphic scales - title block set-up, information title blocks, drawing scales; systems of measurement and preferred scales - drawing scales
- DOS and Windows application definitions
- techniques and practices in the application of program assist and editing commands
- view and display commands (e.g. zooming and panning)
- query commands to extract drawing data
- techniques and practices in the application of changes to text styles text entering and editing
- existing drawing modifications
- working with multiple drawings using cut and paste, etc.
- components and symbol libraries creation, editing and retrieval
- plotting drawings to the proper scale

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REQUIRED SKILLS AND KNOWLEDGE

- scaling techniques applications
- layering techniques applications
- Line-Type (LT) scale usage
- drawing techniques application
- drawing setups to applicable standards (e.g. settings, layers, line types, and widths)
- 2-D drawing creation
- Cartesian, polar, absolute, and relative coordinates usage in drawing lines and shapes
- techniques and practices in the application of geometric construction
- techniques and practices in the application of text to a drawing
- techniques and practices in altering font options
- techniques and practices in the application of laying out, drawing, and completing orthographic drawings
- techniques and practices in the application of drawing objects in isometric using isometric drawing commands
- techniques and practices in the application of completing primary auxiliary drawings on the CAD equipment
- techniques and practices in the application of CAD to draw screw threads
- techniques and practices in the application of making, setting, and using layers and blocks

T19 Basic production fabrication drawings to Australian/New Zealand and industry standards encompassing:

- principles, terms, symbols, codes and conventions usage in production fabrication drawings
- types and usage techniques of detailed and assembly drawings
- detailing: encompassing principals, concepts and applications of detailing; terms, conventions and codes related to detailing; detailing types, application and selection; different fabrication processes and identification of machine parts; rules for drawing machine part details; concepts of units of measurement usage related to detailing; application of properties and relationships of triangles and circles to solve geometric shapes related to detailing
- assembly drawings: encompassing principals, concepts and applications of assembly drawings; terms, conventions and codes related to assembly drawings; different assembly processes and identification of machine part assemblies; rules for drawing assembly drawings; concepts of units of measurement usage related to assembly drawings; application of properties and relationships of triangles and circles to solve geometric shapes related to assembly drawings
- machine assembly drawing production
- detail drawings standard machine fits applications
- drawings for welded component parts
- parts list (e.g. balloons) development

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REQUIRED SKILLS AND KNOWLEDGE

- file and/or drawing for CAD/CAM applications
- gears drawings
- cams drawings
- threads and fasteners (e.g. bolts, pins, and keys) use and applications
- drawings for metal bending and fabricating
- standard fits, finishes, and tolerances to a machine drawing applications
- manufacturing processes (e.g. machine, metal forming, and CNC)

T20 Pattern development encompassing:

- principles, concepts and purpose of pattern development
- terms, conventions and codes related to pattern development
- types and usage techniques of pattern development and related drawings
- application of pattern development and intersection techniques
- intersections of geometric surfaces development techniques and applications
- flat surfaces development techniques and applications
- construct of objects from the intersection

T21 Maps and profiles design and production to Australian/New Zealand and industry standards encompassing:

- principals, concepts and applications of maps and profiles design and production
- terms, conventions and codes related to maps and profiles design and production
- maps and profiles design and production types and uses
- rules for cartography
- components selection and transit usage
- symbols usage and applications for topography
- application of properties and relationships of triangles to solve geometric problems; trigonometric relations to solve right triangles, law of sines and cosines to solve triangles

T22 Pipe/plumbing drawings basics encompassing:

- principles, purpose, terms and conventions usage in pipe/plumbing drawings
- applicable codes, symbols and abbreviations
- piping symbols, fittings, fixtures, and valves
- types of piping systems and usage techniques in pipe drawings
- principles of pneumatics and hydraulics
- pneumatics and hydraulic schematics production
- plumbing schematics production
- techniques and applications in creating drawings of piping symbols and systems

T23 Structural steel, welding and sheet metal drawings basics encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- principles, terms and conventions usage in structural steel, welding and sheet metal drawings
- applicable codes (e.g. OHS, Standards Australia/Zealand, building codes and regulations, related standards and codes)
- classification of major structural and welding components
- rules and symbols used in structural and welding drawings
- structural steel shapes
- steel-framing materials
- detail and assembly drawings (including beam connections) with bill of materials
- steel frame plan drawings production
- types and usage techniques of structural and welding drawings
- techniques and applications in creating structural drawings using measuring, labeling, and symbol procedures
- techniques and applications used in drafting the processes for joining metal and standard symbols for welding
- techniques and applications in creating welding drawings complete with weld symbols
- sheet metal layout methods and procedures
- representative sheet metal drawings
- sheet metal drawings for CAD/CAM applications

T24 Ink overlay drawings produced to Australian/New Zealand and industry standards encompassing:

- principals, concepts and applications of ink overlay drawings production
- terms, conventions and codes related to ink production
- drawing specifications identification and analysis
- rapid graph equipment usage procedures

T25 Drawings reproductions to Australian/New Zealand and industry standards encompassing:

- principals, concepts and applications of drawing reproductions
- terms, conventions and codes related to processes related to drawing reproductions
- rules for reproducing drawings
- various machines usage and selection in the reproduction process

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EVIDENCE GUIDE

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Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Prepare electrotechnology/ utilities engineering drawings using manual drafting and CAD applications as described in 8) Range and including:

A	Carrying out freehand sketching of simple electrotechnology/ utilities products, and components using pictorial methods to generate two and three dimensional electrotechnology/ utilities images encompassing a range of standard components, such as devices, components, parts, equipment and structures, sketched together with other solid and hollow

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	items.
B	Preparing and modifying preliminary electrotechnology/ utilities drawings and diagrams using manual drafting methods, techniques, procedures and devices
C	Preparing and modifying preliminary electrotechnology/ utilities drawings and diagrams using computer-aided design equipment and software
D	Notating type, form and size of materials from information, abbreviations and symbols supplied on electrotechnology/ utilities drawings, briefs and/or specifications.
E	Obtaining specifications from design information, customer requirements, sketches, preliminary layouts and/or field investigations.
F	Drawing single part components, simple electrotechnology/ utilities assemblies for fabrication, assembly or installation of products encompassing dimensions, fabrication and/or installation notes, and parts lists from predetermined dimensions, associated tolerances and design specifications
G	Using CAD equipment and related commands and drawing environments to produce setting out details; drawing template for a range of paper sizes, the drawing title and scale used, date of drawing and other relevant information; and/or working drawings
H	Stating the purpose and usage of a variety of atypical electrotechnology/ utilities drawings for electrotechnology and electricity supply industry applications
I	Generating a variety of CAD drawings from 2D components to 3D models by applying relevant techniques and processes, extracting properties, applying basic rendering techniques and incorporating pre-prepared symbols to construct electrotechnology/ utilities diagrams and assembly drawings to produce section, surface modelling, solid modelling, and wireframe modelling views
J	Applying safety precautions when working with CAD equipment

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to preparing electrotechnology/ utilities engineering drawings using manual drafting and CAD applications

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units covering the preparing electrotechnology/ utilities engineering drawings using manual drafting and CAD applications

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to the preparation of electrotechnology/utilities engineering drawings using manual drafting and CAD applications:

- Covers mechanical, fabrication, fluid power
- Drawings include component drawings for fabrication, assembly and sub-assembly drawings, installation drawings, fault location aids such as flow diagrams and modifications (version control), and conversion between drawing types
- Engineering drafting specifications, layouts, sketches or verbal instructions in conformance with Australian Standards and enterprise standards for electrotechnology/ utilities applications
- Manual drafting methods, techniques, procedures and devices
- Type, form and size of materials from information, abbreviations and symbols supplied on electrotechnology / utilities related engineering drawings, briefs and/or specifications
- Sketching methods, techniques, procedures and devices encompassing freehand sketching
- Specifications may be obtained from design information, customer requirements, sketches, preliminary layouts and/or field investigations
- Geometric construction
- Multi-view orthographic projections
- Auxiliary views
- Descriptive geometry/revolutions
- Sectional views/conventions
- Pictorial drawings
- Dimensioning/size description and tolerancing
- Development layouts
- Layout drawings
- Technical illustrations
- Graphs and charts
- Thread representations
- Working drawings
- Technical drawing equipment including computer-aided drawing design (CAD) applications, peripherals and devices
- Care and use of equipment

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RANGE STATEMENT

- Safety precautions when working with CAD equipment
- Fabrication drawings
- Pattern development
- Maps and profiles design
- Pipe/plumbing drawings
- Structural steel and sheet metal drawings
- Ink overlay drawings production
- Drawings reproductions
- Organisational procedures for preparation and production of drawings, drawing sets, specifications, drafting documentation and operating and maintenance instructions/manuals for products and systems
- Organisational procedures for processing, filing and saving all graphics, specifications, instructions and related documentation in correct format and location in accordance with work site procedures
- Organisational procedures for collaborating with the client, key stakeholders and other staff in the selection of the preferred option

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEE191A Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the preparation of, and modification of, preliminary electrotechnology/utilities drawings and diagrams using manual drafting methods, techniques, procedures and devices and computer-aided design equipment and software from specifications, layouts, sketches or verbal instructions in conformance with Australian Standards and enterprise standards.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED104A	Use software for engineering applications
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures in preparation for the work are followed
		1.3	The extent of the work is determined from project specifications and discussion with appropriate personnel
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
		1.5	Software tools and equipment a needed for the work are obtained in accordance with established procedures
2	Prepare electrotechnology/utilities drawings using manual drafting and	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	The types of design detailed drawings and layouts

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ELEMENT	PERFORMANCE CRITERIA	
CAD equipment and software.		required are determined from project specifications
	2.3	Technical data of system components is interpreted to determine parameters that are to be included in the detailed drawings
	2.4	Appropriate software tools are used to produce detailed drawings based on standard protocols
	2.5	Detailed drawings are checked for accuracy are compliance with project specifications
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Complete electrotechnology/utilities drawings using manual drafting and CAD equipment and software	3.1	Completed drawings are submitted to an appropriate person to be checked for accuracy and compliance with project specifications.
	3.2	Any alterations, additions or correction instructions are followed and drawings are re-submitted for final approval
	3.3	Copies of completed drawings are filed securely in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and the preparation of electrotechnology/utilities drawings using manual drafting and CAD equipment and software.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE191A Electrotechnology/ utilities drawings and diagrams

Evidence shall show an understanding of electrotech/utilities drawings and diagrams to an extent indicated by the following aspects

T1 Electrotechnology/ utilities drafting fundamentals encompassing:

- principles, concepts and purpose of electrotechnology/ utilities drafting
- terms, conventions and codes related to electrotechnology/ utilities drafting
- rules and symbols used in electrotechnology/ utilities drafting
- types and usage techniques of electrotechnology/ utilities drawings
- techniques and applications for creating graphic symbols charts
- techniques and applications in composing block diagram drawings

T2 Standard drawing sheets and drawing sheet layout encompassing

- standard drawing sheet borders
- standard drawing sheet scale
- standard drawing sheet editing - routine
- standard drawing sheet editing - title block
- standard drawing sheet editing - revision blocks
- drawing sheet layout for small electrotechnology/ utilities projects
- drawing sheet layout for large electrotechnology/ utilities projects
- drawing sheet layout for signing and markings projects
- key plan sheets
- drawing layers
- line types

T3 Electrotechnology/ utilities drawings line work, symbols, lettering and techniques production to Australian/New Zealand and industry standards encompassing:

- principles of correct drafting technique
- principles, concepts and purpose of electrotechnology/ utilities drawings
- terms, symbols (including sectional symbols), conventions and codes related to electrotechnology/ utilities drawings

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REQUIRED SKILLS AND KNOWLEDGE

- rules for drafting electrotechnology/ utilities drawings
- types and usage techniques of electrotechnology/ utilities drawings
- relationship between components and symbols used in drafting applications
- techniques and applications for production of electrotechnology/ utilities drawings

T4 Sketching techniques for electrotechnolgy/ utilities applications encompassing:

- lines and letters
- shapes
- solids
- axonometric views
- building sketch
- isometric views
- object sketch
- perspective; building interior perspective sketch
- detail labelled sketch

T5 Pole and structure elevations encompassing:

- elevation sheet layout
- elevation labeling
- concrete bases
- luminaire pole elevations
- signal pole elevations
- service pole elevations
- sign pole elevations
- sign bridge and cantilever elevations
- breakaway sign structures
- wood post sign structures

T6 Survey base plan drawings encompassing:

- survey base plan scale
- survey base plan
- survey base plancontents
- modelspace and paperspace
- external reference (xref) drawings
- viewports

T7 Auxiliary Views and Revolutions encompassing:

- principles, concepts and purpose of auxiliary views and revolutions
- terms, conventions and codes related to auxiliary views and revolutions
- rules of revolutions
- types and usage techniques of auxiliary views, auxiliary reference planes and revolutions

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REQUIRED SKILLS AND KNOWLEDGE

- techniques and applications in finding the true size of an oblique surface
- secondary auxiliary view drawing techniques and applications
- applications of revolutions
- usage of the axis of revolution to draw the true shape of an oblique view

T8 Map Drafting encompassing:

- types and usage techniques of map drafting and illustrated maps
- techniques and applications of plat surveys and set plans
- techniques and applications of contour maps using profile coordinates
- map reading techniques and applications
- map drawing techniques and applications

T9 Civil/GIS (Geographic Information Systems) drawings basics encompassing:

- principles, terms and conventions usage in civil GIS drawings
- land surveying techniques (e.g. property line, corners, symbols, coordinates, base line, and typical sections)
- GIS and Global Positioning Systems (GPS) uses and applications
- land survey plot production from a written description
- manual and computer methods calculation of area
- contour plans
- profile drawings

T10 Architectural and site plan drawings for electrotechnology/ utilities applications encompassing:

- principles, purpose, terms and conventions usage in basic architectural drawings
- typical scales
- base plan symbols and labels
- electrotechnology/ utilities site plan symbols and labels
- signing and markings site plan symbols and labels
- architectural design and planning principles
- elevation drawings
- architectural symbols and abbreviations usage
- floor plans layout and production
- basic construction terminology and materials
- perspectives and pictorials
- typical wall and building sections with necessary details
- applicable building codes
- as-built floor plan measurement, sketching, and drafting
- usage of schedules in freehand architectural style lettering
- styles of architecture
- fundamentals and design function in residential design
- site plans production

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REQUIRED SKILLS AND KNOWLEDGE

- foundation plan production

T11 AutoCAD basics for electrotechnology/ utilities applications encompassing:

- operating system fundamentals encompassing: principals, concepts and applications of CAD hardware; terms, conventions and codes related to CAD hardware; CAD hardware type and variation; system specifications interpretation and usage; I/O devices identification; computer components installation and configuration arrangements and application
- CAD filing and naming conventions
- opening program/closing and saving drawings
- basic drafting commands encompassing: line; circle; spline; rectangle
- basic modification commands encompassing: erasing; copy; mirror; block; trim; extend
- layout and plotting
- design centre encompassing: electrical symbols; electronic symbols
- AutoCAD and lists
- components and symbols in CAD
- mass storage and file compression
- network operating systems, protocols, and cabling systems
- researching hardware and software
- installation and configuration of operating systems
- plotting solutions
- security issues
- system maintenance
- user interface
- object creation and modification
- editing
- layers
- properties
- paper space and model space concepts
- dimensioning and dimensioning variables
- blocks
- attributes
- three dimensional construction
- solid modelling and scripts
- library construction
- database manipulation
- data extraction
- circuit simulation
- wiring symbols - motor and generator, AC and DC; wiring junctions; grounds; distinguishing power and control conductors; normally open and normally closed contacts; series and shunt coils; circuit protection devices - overload relay

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REQUIRED SKILLS AND KNOWLEDGE

w/thermal element, fuse, circuit breakers; push button - disconnect switches, momentary contact, maintained contact; meters; resistors; transformers - power, current, potential, auto-transformers

T12 Drawing numbering, file names and digital file storage encompassing:

- drawing series and version control
- drawing sheet numbering
- drawing file names
- drawing storage
- drawing file

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Preparation of electrotechnology/utilities drawings using manual drafting and CAD equipment and software as described in 8) Range and including:

A	Carrying out freehand sketching of simple electrotechnology/ utilities products, circuits and components using pictorial methods to generate two and three dimensional electrotechnology/ utilities images encompassing a range of standard components, such as devices, components, parts, equipment and structures,

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	sketched together with other solid and hollow items.
B	Preparing and modifying preliminary electrotechnology/utilities drawings and diagrams using manual drafting methods, techniques, procedures and devices
C	Preparing and modifying preliminary electrotechnology/utilities drawings and diagrams using computer-aided design equipment and software
D	Notating type, form and size of materials from information, abbreviations and symbols supplied on electrotechnology/ utilities drawings, briefs and/or specifications.
E	Obtaining specifications from design information, customer requirements, sketches, preliminary layouts and/or field investigations.
F	Drawing single part components, simple electrotechnology/ utilities assemblies and circuits for fabrication, assembly or installation of products encompassing dimensions, fabrication and/or installation notes, wiring schedules and parts lists from predetermined dimensions, associated tolerances and design specifications
G	Using CAD equipment and related commands and drawing environments to produce setting out details; drawing template for a range of paper sizes, the drawing title and scale used, date of drawing and other relevant information; and/or working drawings
H	Stating the purpose and usage of a variety of typical electrotechnology/utilities drawings for electrotechnology/ utilities industry applications
I	Generating a variety of CAD drawings from 2D components to 3D models by applying relevant techniques and processes, extracting properties, applying basic rendering techniques and incorporating pre-prepared symbols to construct electrotechnology /utilities diagrams and assembly drawings to produce section, surface modelling, solid modelling, and wireframe modelling views
J	Applying safety precautions when working with CAD equipment

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation preparation of electrotechnology/utilities drawings using manual drafting and CAD equipment and software

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units covering the development of electrotechnology/utilities drawings is required.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to the preparation of electrotechnology/utilities drawings using manual drafting and CAD equipment and software:

- Drawings include layouts, assembly and installation drawings, and modifications (version control), and conversion between drawing types
- Electrotechnology drafting specifications, layouts, sketches or verbal instructions in conformance with Australian Standards and enterprise standards
- Manual drafting methods, techniques, procedures and devices
- Type, form and size of materials from information, abbreviations and symbols supplied on electrotechnology drawings, briefs and/or specifications
- Sketching methods, techniques, procedures and devices encompassing freehand sketching
- Specifications may be obtained from design information, customer requirements, sketches, preliminary layouts and/or field investigations
- Electrotechnology drawings line work, symbols, lettering and techniques
- Sketching techniques
- Technical drawing equipment including computer-aided drawing design (CAD) applications, peripherals and devices including AutoCAD basics for electrotechnology applications and related commands
- Safety precautions when working with CAD equipment
- Pole and structure elevations
- Survey base plan drawings
- Auxiliary Views and Revolutions
- Map Drafting
- Civil/GIS (Geographic Information Systems) drawings basics
- Architectural and site plan drawings
- Organisational procedures for preparation and production of drawings, drawing sets, specifications, drafting documentation and operating and maintenance instructions/manuals for products and systems
- Organisational procedures for processing, filing and saving all graphics, specifications, instructions and related documentation in correct format and location in accordance with work site procedures
- Organisational procedures for collaborating with the client, key stakeholders and other staff in the selection of the preferred option

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrotechnology

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UEENEEE192A Produce detailed electrotechnology /utilities drawings using computer aided design equipment and software

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the production of, and modification and maintenance of, detailed electrotechnology/utilities drawings and diagrams using computer-aided design (CAD) equipment and software from specifications, layouts, sketches or verbal instructions in conformance with Australian Standards, enterprise standards and/or design brief.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENED1 04A	Use software for engineering applications
UEENEEE1 01A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE1 02A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE1 04A	Solve problems in d.c. circuits
UEENEEE1 07A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE1 90A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications
UEENEEE1 91A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to produce detailed electrotechnology /utilities drawings	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	The extent of the work is determined from project specifications and discussion with appropriate personnel
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Software tools and equipment a needed for the work are obtained in accordance with established procedures

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ELEMENT	PERFORMANCE CRITERIA	
2 Produce detailed electrotechnology /utilities drawings.	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	The types of design detailed drawings and layouts required are determined from project specifications
	2.3	Technical data of system components is interpreted to determine parameters that are to be included in the detailed drawings
	2.4	Appropriate software tools are used to produce detailed drawings based on standard protocols
	2.5	Detailed drawings are checked for accuracy are compliance with project specifications
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Complete detailed electrotechnology /utilities drawings.	3.1	Completed detailed drawings are submitted to an appropriate person to be checked for accuracy and compliance with project specifications.
	3.2	Any alterations, additions or correction instructions are followed and detailed drawings are re-submitted for final approval
	3.3	Copies of completed detailed drawings are filed securely in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and using drawings, diagrams, schedules and manuals.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE192A Detailed electrotechnology /utilities drawings

Evidence shall show an understanding of detailed electrotechnology /utilities drawings to an extent indicated by the following aspects

T1 Detailed working drawings encompassing:

- definition of detailed working drawings
- usage and types of detailed working drawings
- composition and layout of detailed working drawings
- preparation of detailed working drawings

T2 Advanced (master) sketching techniques encompassing:

- lines and letters
- shapes
- solids
- axonometric views
- building sketch
- isometric views
- object sketch
- perspective; building interior perspective sketch
- detail labelled sketch
- complex surfaces with tangent and curvature continuities
- surfaces manipulation using editing tools
- surfaces analysis for quality and desired characteristics

T3 Drafting/modelling electrotechnology/ utilities encompassing:

- standard documentation practices for block diagrams
- wiring diagrams
- circuit schematics
- control circuits
- creating one-line diagrams
- standard PCB layouts
- printing wiring assemblies
- art masters

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REQUIRED SKILLS AND KNOWLEDGE

T4 Electrotechnology/ utilities related drawings encompassing:

- charts and graphs; encompassing alternating current, frequency, electromagnetisms, signals, transmission
- measuring devices and gauges
- power sources, transformers, alternators, motors and related applications
- earthing
- conduits, boxes and fittings, harnesses, cable trays and ducts
- conductor terminations, splices, installations and wiring schedules
- busways
- electric services installations
- protection devices -over current and voltage, circuit breakers, and fuses
- switches, contactors and relays
- control systems and devices
- HV devices and apparatus
- cabinet and panel layouts
- plot and floor plans
- electric lighting
- analogue and digital systems, circuits, electronic components and devices - connections; resistors; capacitors; magnetic devices; piezoelectric devices, crystals and resonators; transducers, sensors and detectors; solid state components and semiconductors; display technologies – filament, LED, LCD, discharge devices, thermionic valves, vacuum tubes; assemblies, modules; prototyping aids; mechanical accessories
- data networks, communication and telecommunications equipment and devices
- pneumatic and hydraulic circuits, including related piping ware and components

T5 AutoCAD – functional for electrotechnology/ utilities encompassing:

- user coordinates systems
- Right-Hand Rule
- 2D geometry extrusion
- 2D views from 3D models and visa-versa
- user coordinate systems creation
- 3D wireframe geometry creation
- 3D faces on wireframe geometry placement
- 3D geometry viewing
- surfaces construction
- working drawings generation
- drawing set up using model space and paper space; encompassing printing and plotting
- plotting
- rendering

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REQUIRED SKILLS AND KNOWLEDGE

- 3D models construction
- 3D surface models construction
- 3D models display from different vantage points
- orthographic drawings constructed from 3D models
- rendered images creation
- solid modelling construction using Boolean operations
- scripts writing and tool button macros application
- organisation of writing scripts and tool button macros commands
- advanced drawing, editing, and configuration procedures application
- basic user-level system customisation
- design environment
- basic workflow

T6 AutoCAD – project basics encompassing:

- project manager
- project drawing list
- projects progression/stages
- projects copy and activation

T7 AutoCAD – schematic wiring, editing, components and reporting encompassing:

- wiring and ladders
- wire types, wire numbers
- source and destination signal arrows
- multiple phase and multi wire circuits
- circuits
- connectors and point-2-point wiring
- basic editing utilities
- miscellaneous tools
- data tools
- re-sequence and retag drawings
- using the auditing tools
- schematic symbol annotation
- inserting schematic symbols
- swapping and updating blocks
- inserting schematic components from lists
- generating schematic reports

T8 AutoCAD – panel layouts encompassing:

- creating panel layouts from schematic lists
- din rail utility usage
- panel footprints

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REQUIRED SKILLS AND KNOWLEDGE

- terminal strip editor usage
- panel layout annotation and reports

T9 AutoCAD – PLC modules encompassing:

- PLC I/O modules
- PLC modules builder
- PLC database file editor; encompassing insert and edit in parametric PLC modules, nonparametric PLC modules, and stand-alone PLC I/O points
- PLC I/O address-based tagging
- spreadsheet to PLC I/O utility

T10 AutoCAD - detailed settings and configurations – advanced commands encompassing:

- drawing properties
- project properties
- creating wire types
- reference files usage
- creating drawing templates
- installation and search paths

T11 AutoCAD – detailed customised components and customised detailed data encompassing:

- schematic symbols
- icon menu system
- panel footprints
- part catalogue databases usage
- pin list database editor
- title block update and attributes
- terminal properties editor
- reference files usage

T12 AutoCAD – advanced auditing tools, automation tools and integration encompassing:

- auditing tools
- trouble shooting tools
- updating schematics from spreadsheets
- generating automatic reports
- AutoCAD integration
- din rail editor
- footprint with wire annotation
- conduit tools
- cables management

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REQUIRED SKILLS AND KNOWLEDGE

T13 AutoCAD – database management and productivity tools encompassing:

- title block attributes automation tools update
- schematics update spreadsheets
- adding wire data to footprints
- managing cables
- using the circuit builder
- working with peer-to-peer

T14 Drawings production using CAD application programs encompassing:

- principals, concepts and applications of drawings production using CAD application programs
- terms, conventions and codes related to drawings production using CAD application programs
- drawing production types using CAD application programs
- CAD advanced commands identification and application for drawings
- CAD advanced commands identification and application for editing drawings
- CAD advanced commands identification and application for hardcopy drawings
- techniques and applications in producing detailed architectural drawings of a floor plan, elevation, and exterior wall section for a residential structure related to electrotechnology/ utilities applications

T15 Utility programs disk and file management encompassing:

- principals, concepts and applications of disk and file management of utility programs
- terms, conventions and codes related to disk and file management of utility programs
- disk operating system commands identification and usage
- utility commands identification and usage
- commands for word processing identification and usage

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Producing detailed electrotechnology /utilities drawings using computer aided design equipment and software as described in 8) Range and including:

A	Producing, modifying and maintaining detailed electrotechnology/ utilities drawings and diagrams using computer-aided design (CAD) equipment and software
B	Producing master sketches of complex electrotechnology/ utilities drawings using pictorial methods and scaling to

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	generate relevant dimensional electrotechnology/ utilities images
C	Identifying, selecting and determining uses for a range of materials and equipment used in electrotechnology/ utilities engineering drafting applications
D	Drawing single and multi-part components and detailed electrotechnology/ utilities assemblies
E	Using advanced CAD equipment commands and drawing techniques and processes to produce detailed electrotechnology/utilities drawings
F	Using filing systems for managing, entering and/or retrieving technical information from computer related database programs
G	Applying safety precautions when working with CAD equipment

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to using drawings, diagrams, schedules and manuals.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units covering the production of detailed drawings using computer aided design equipment and software for other disciplines.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to producing detailed electrotechnology /utilities drawings using computer aided design equipment and software covering:

- Drawings include detailed circuit and wiring diagrams/schedules, block diagrams, schematics, printed circuit board layouts, assembly and installation drawings, modification drawings, and conversion between drawing types.
- Electrotechnology/ utilities specifications, layouts, sketches or verbal instructions in conformance with Australian Standards, enterprise standards and/or design brief.
- Master sketches methods, techniques, procedures and devices encompassing freehand sketching
- Type, form and size of materials from information, abbreviations and symbols supplied on electrotechnology/ utilities engineering drawings, briefs and/or specifications
- Specifications may be obtained from design information, customer requirements, sketches, preliminary layouts and/or field investigations
- Materials and equipment used in electrotechnology/ utilities engineering applications by selecting the correct type, form and size of materials and equipment from information, abbreviations and symbols supplied on detailed electrotechnology/ utilities engineering drawings, briefs and/or specifications
- Advanced computer-aided design (CAD) equipment commands and drawing techniques and processes
- CAD application programs and advanced tools
- Utility programs disk and file management
- Filing systems management including entering/retrieving technical information from computer related database programs for the production, modification and/or maintenance of detailed electrotechnology/ utilities drawings
- Safety precautions when working with CAD equipment
- Detailed working drawings
- Drafting/modelling electrotechnology/ utilities
- Detailed electrotechnology/ utilities drawings including a representative array of relevant 2D and 3D CAD drawings
- Single and multi-part components and detailed electrotechnology/ utilities assemblies for fabrication, assembly, installation and/or modification of products encompassing dimensions encompassing dimensions; fabrication,

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RANGE STATEMENT

assembly, installation and/or modification notes, circuit/wiring layouts/schedules and parts lists from specified dimensions, associated tolerances and design specifications.

- Architectural drawings for electrotechnology/ utilities applications
- Organisational procedures for preparation and production of drawings, drawing sets, specifications, drafting documentation and operating and maintenance instructions/manuals for products and systems
- Organisational procedures for processing, filing and saving all graphics, specifications, instructions and related documentation in correct format and location in accordance with work site procedures
- Organisational procedures for collaborating with the client, key stakeholders and other staff in the selection of the preferred option

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEF101A Install and connect cabling for direct access to telecommunications service

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and termination of telecommunications cabling in buildings and premises. It encompasses working safely and to Australian Communications and Media Authority's ‘restricted’ Cabling Provider Rule, installing telephone line, two-pair (quad) cables, terminating on socket outlets, testing and compliance checks and completing cabling documentation.

Application of the Unit

Application of the Unit **2)**

This unit applies to customer cabling that terminates directly on permitted sockets and the like, and to the installation, maintenance and modification of indoor, external, underground cabling Customer cabling, for the purpose of this standard, may be used to connect devices for a range of applications, including for example: telecommunications (phones and facsimile), data, including video and multimedia, security and alarms, and fire protection.

Licensing/Regulatory Information

License to practice **3)**

This unit meets the minimum ACMA ‘prescribed level of

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License to practice **3)**

knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved'. Therefore, skills and knowledge described in this unit may only be practised under the requirements set out in ACMA 'Restricted' Cabling Provider Rule.

Practice of this competency standard unit is also subject to regulations directly related to occupational health and safe and contracts of training where they apply.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEF106A	Solve problems in data and voice communications circuits

OR

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Prerequisite Unit(s) **4)**

UEENEEE104A	Solve problems in d.c. circuits

AND

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to lay and connect cabling for direct access to telecommunication services	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
		1.2	Health and safety risks are identified and established risk control measures and procedures are followed in preparation for the work.
		1.3	Remote power feeding is identified and established risk control measures prepared.
		1.4	The nature and location of the work is determined from documentation or discussions with appropriate person(s) to establish the scope of work to be undertaken.
		1.5	Cable routes are planned within the constraints of the building structure, significants and regulations.
		1.6	Earthing requirements are determined with consideration of existing earthing arrangements, where applicable and of cable system earth upper and lower resistance limitations.
		1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
		1.8	Sources of materials that may be required for the work are established in accordance with established routines and procedures.
		1.9	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Lay and connect cabling for direct access to telecommunication services	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Installed support structure is checked to ensure cable will not be exposed to damage during installation and general operation.
	2.3	Sufficient excess is allowed at cable ends to facilitate termination.
	2.4	Telecommunication outlet ends of cable are uniquely labelled to match identifier at originating location.
	2.5	Cable is placed and secured to maintain safety and interference segregation in accordance with legislative and industry standards.
	2.6	Cable ties not tightened to the point of causing cable sheath damage or transmission impairment are trimmed flush to prevent risk of personal damage.
	2.7	Cables installed as catenaries or supported by catenaries in external environment shall meet minimum above ground clearances and clearances from hazardous electrical services as per AS/ACIF S009.
	2.8	Cables installed underground shall meet minimum depth of cover and segregation from hazardous electrical and other services as per AS/ACIF S009.
	2.9	Over-voltage protection devices are fitted to all cable pairs, where required, to suppress voltage surges with the devices protectively earthed. In accordance with AS/ACIF S009.
	2.10	TRC/CES/Earth wire insulation is protected against damage and TRC/CES and protective earths segregated in accordance with relevant industry and legislative standards AS/ACIF S009.
	2.11	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.12	Cabling is installed efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or services.

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ELEMENT	PERFORMANCE CRITERIA	
	2.13	Routine quality checks are carried out to ensure cabling complies with requirements.
3. Terminate and test cables and earth wires.	3.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Cable sheath removed to allow for correct termination length and without damage to underlying conductors and their insulation.
	3.3	Network termination device is installed in accordance to manufacturer specifications and cable pairs neatly and sequentially fanned for termination.
	3.4	Conductors are terminated in accordance with recommended colour code sequence using appropriate termination tools in the manufacturer specified manner.
	3.5	Cable shield (if applicable) is earthed to manufacturer specifications and relevant industry codes of practice including AS/ACIF S009.
	3.6	Visual inspection is undertaken to confirm termination colour code sequence has been followed prior to end-to-end testing of wire and pair termination integrity.
	3.7	Cable pairs are tested and clearly labelled to provide an accurate identification in accordance with requirements.
	3.8	TRC/CES /Earth wires are terminated with connectors recommended by manufacturers in accordance with relevant industry codes of practice including AS/ACIF S009.
	3.9	TRC/CES /Earth wire continuity is maintained through out and interface requirements with electrical systems are observed.
	3.10	TRC/CES /Earthing installation is tested for continuity, insulation resistance and conductive resistance as per relevant industry standards including AS/ACIF S009.
	3.11	Compatibility of alterations with existing systems is confirmed and new work tested both in isolation and when integrated with existing systems.
	3.12	Procedures for referring non-routine events to immediate

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ELEMENT	PERFORMANCE CRITERIA	
		supervisor for directions are followed.
	3.13	Cabling is terminated efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or services.
	3.14	Routine quality checks are carried out and defects rectified to ensure cabling comply with requirements.
4 Complete cabling work, records and reporting.	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.
	4.3	Cabling completion advice is documented and reported in accordance with requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and laying and connecting cabling for direct access to telecommunication services.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF101A Telecommunications Restricted CPR regulations and installations

Evidence shall show an understanding of telecommunications restricted CPR regulations and installations, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Telecommunication industry overview encompassing:

- Telecommunication Industry
- Overview of Telecommunications network
- Overview of Telecommunications Act 1997
- Role of ACMA and ACIF
- Telecommunications terminology

T2. Telecommunication technical standards encompassing:

- ACMA Technical Standards TS008, TS009
- SAA Communications Cabling Manual (Restricted) (starter kit) as approved by relevant bodies – Standards Australia/ACIF
- International Standards – ISO, IEC, ITU
- Building Code of Australia (BCA)
- AS/NZS 3000 Wiring Rules
- National Association of Testing Authorities NATA

T3. Cabling Provider Rules (CPR) encompassing:

- Australian Communications Media Authority (ACMA)
- Telecommunications Cabling Provider Rules
- CPR registration
- Old Telecommunication Licensing structures
- Inspection of work
- Documentation – TCA1 form

T4. Cable type and identification encompassing:

- Cable types – unshielded twisted pair, shielded twisted pair, indoor, underground and aerial.
- Cable construction
- Cable identification – codes (colour, banded, numbered, lettered)

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REQUIRED SKILLS AND KNOWLEDGE

T5. Cable installation encompassing:

- Cable damage
- Cable packaging
- Cable dispensing devices
- Cable insertion and hauling
- Lead-in conduit requirements (including wall box installation)
- Wiring diagrams
- Segregation of cables
- Aerial cable fittings and additional safety aspects required.

T6. Termination of Telecommunication Cables encompassing:

- Sheath stripping – methods, precautions
- Pair identification
- End to end testing
- Filled cable termination
- Termination systems – telephone outlets and sockets, network terminating devices (NTD)
- Connector jointing e.g. external to internal cable where required

T7. Telecommunication earthing and protection encompassing:

- Customer lightning protection (CLP)
- CLP earthing
- Carrier's policy requirement covering materials (including surge suppression devices) and
- Practices (including earth bonding arrangements)

T8. Basic telephony encompassing:

- Basic telephone service
- Telephone
- Exchange number
- Connection equipment / lead in cable
- Dialling signals – pulse dialling, tone dialling, ring equivalence number (REN)

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Laying and connecting cabling for direct access to telecommunication services as described in 8) and including:

A Terminating at both network termination device and at least two different outlet types and locations

B Placing of cables on support structures and building faces for both internal and external

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	locations
C	Securing cables correctly for above locations
D	Avoiding cable damage such as crushing, burning, kinking, sheath twist, cutting and nicking, bending radius
E	Reading and interpreting drawings related to outlet and service entry location
F	Conducting and interpreting cable test results
G	Correctly interpreting and applying standards and regulations
H	Completing the required documentation
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to laying and connecting cabling for direct access to telecommunication services.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to cabling installations applicable to single telephone line (two-pair) and directly connected to telephone sockets. It includes terminating, placing of cables on support structures and building faces, securing cables correctly for above locations, avoiding cable damage, reading and interpreting drawings, conducting and interpreting cable test results, applying standards and regulations, and completing the required documentation.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF102A Install and maintain cabling for multiple access to telecommunication services

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and maintenance of telecommunications cabling in buildings and premises. It encompasses working safely and to Australian Communications and Media Authority's ‘Open’ Cabling Provider Rule, installing multiple telephone line, multi-pair cables, backbone cabling, terminating in socket outlets, termination modules and distributors, testing and compliance checks and completing cabling documentation.

Application of the Unit

Application of the Unit **2)**

This unit applies to customer cabling terminated on distributors and to the installation, maintenance and modification of indoor, external, underground cabling Customer cabling, for the purpose of this standard, may be used to connect devices for a range of applications, including for example: telecommunications (phones and facsimile), data including video and multimedia, security and alarms, and fire protection.

Licensing/Regulatory Information

License to practice **3)**

This unit meets the minimum ACMA ‘prescribed level of

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License to practice **3)**

knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved'. Therefore, skills and knowledge described in this unit may only be practised under the requirements set out in ACMA 'Open' Cabling Provider Rule.

Practice of this competency standard unit is also subject to regulations directly related to occupational health and safe and contracts of training where they apply.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits

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Prerequisite Unit(s) **4)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and maintain cabling.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Health and safety risks are identified and established risk control measures and procedures are followed in preparation for the work.
	1.3	Remote power feeding is identified and established risk control measures prepared.
	1.4	The nature and location of the work is determined from documentation or in discussion with appropriate person(s) to establish the scope of work to be undertaken.
	1.5	Cable routes are planned within the constraints of the building structure, significants and regulations.
	1.6	Earthing requirements are determined with consideration of existing earthing arrangements, where applicable and of cable system earth upper and lower resistance limitations.
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
	1.8	Sources of materials that may be required for the work are established in accordance with established routines and procedures.
	1.9	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Install and maintain cabling.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Installed support structure is checked to ensure cable will not be exposed to damage during installation and general operation.
	2.3	Catenary supports are secured to building structure and tensioned where necessary to ensure cable weight can be carried in operating conditions with interference and safety segregation maintained including adherence to

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ELEMENT	PERFORMANCE CRITERIA	
		AS/ACIF S009.
	2.4	Protective earthing of metal work is installed in accordance with requirements and to industry standards.
	2.5	Cables/wires are handled in accordance with manufacturer's application specifications including tension and bending stress requirements.
	2.6	Sufficient excess is allowed at cable ends to facilitate termination.
	2.7	Telecommunication outlet ends of cable are uniquely labelled to match identifier at originating location.
	2.8	Cable is placed and secured to maintain safety and interference segregation in accordance with legislative and industry standards.
	2.9	Cable ties not tightened to the point of causing cable sheath damage or transmission impairment are trimmed flush to prevent risk of personal damage.
	2.10	Cables installed as catenaries or supported by catenaries in external environment shall meet minimum above ground clearances and clearances from hazardous electrical services as per AS/ACIF S009.
	2.11	Cables installed underground shall meet minimum depth of cover and segregation from hazardous electrical and other services as per AS/ACIF S009.
	2.12	Over-voltage protection devices are fitted to all cable pairs, where required, to suppress voltage surges with the devices protectively earthed in accordance with AS/ACIF S009.
	2.13	TRC/CES/Earth wire insulation is protected against damage and TRC/CES and protective earths segregated in accordance with relevant industry and legislative standards AS/ACIF S009.
	2.14	Procedures for referring non-routine events to immediate supervisor for directions are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	2.15	Cabling is installed efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or services.
	2.16	Routine quality checks are carried out to ensure cabling complies with requirements.
3. Terminate and test cables and earth wires.	3.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Cable sheath removed to allow for correct termination length and without damage to underlying conductors and their insulation.
	3.3	Terminating modules are installed in accordance to manufacturer specifications and cable pairs neatly and sequentially fanned for termination.
	3.4	Conductors are terminated in accordance with recommended colour code sequence using appropriate termination tools in the manufacturer's specified manner.
	3.5	Cable shield (if applicable) is earthed to manufacturer specifications and relevant industry codes of practice including AS/ACIF S009.
	3.6	Visual inspection is undertaken to confirm termination colour code sequence has been followed prior to end-to-end testing of wire and pair termination integrity.
	3.7	Cable pairs are tested and clearly labelled to provide an accurate identification in accordance with requirements.
	3.8	TRC/CES/Earth wires are terminated with connectors recommended by manufacturers in accordance with relevant industry codes of practice including AS/ACIF S009.
	3.9	TRC/CES /Earth wire continuity is maintained through out and interface requirements with electrical systems are observed.
	3.10	TRC/CES /Earthing installation is tested for continuity, insulation resistance and conductive

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ELEMENT	PERFORMANCE CRITERIA	
		resistance as per relevant industry standards including AS/ACIF S009.
	3.11	Earthing system is labelled in accordance with requirements.
	3.12	Compatibility of alterations with existing systems is confirmed and new work tested both in isolation and when integrated with existing systems.
	3.13	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	3.14	Cabling is terminated efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or services.
	3.15	Routine quality checks are carried out and a defect rectified to ensure cabling complies with requirements.
4 Complete cabling work, records and reporting.	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.
	4.3	Record sheets and plans of cable location, type and infrastructure are accurately created or updated and stored in accordance with customer requirements.
	4.4	Cable pair record books are created or updated to provide an accurate record of pair locations, inter-connections and usage in accordance with industry codes of practice and AS/ACIF S009.
	4.5	Cabling completion advice is documented and reported in accordance with requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and laying and connecting cables for multiple access to telecommunication services.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF102A Telecommunications telephony and switching

Evidence shall show an understanding of telecommunications telephony and switching, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Principles and characteristics of sound encompassing:

- Sound characteristics
- Sound waves
- Distortion
- Attenuation
- Resonant frequency
- Sound pressure levels

T2. Transmission of sound encompassing:

- Compression
- Rarefaction
- Sound transmission
- Wavelength
- Inverse square rule (attenuation)
- Basic telephone construction

T3. Telephone transmitters encompassing:

- Telephone transmitter functions
- Telephone transmitter types
- Capacitive transmitters
- Moving coil transmitters

T4. Telephone receivers encompassing:

- Telephone receiver functions
- Telephone receiver types

T5. Telephone circuits encompassing:

- Components
- Operation of basic telephone
- Operation of basic facsimile machine

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REQUIRED SKILLS AND KNOWLEDGE

- Cables used, colour and termination types

T6. Overview of earthing and protection encompassing:

- Function of earthing
- Earthing requirements

T7. Customer switching systems (CSS), interfaces and devices encompassing:

- System Distribution Frames (SDF)
- Power fail and line interface requirements (e.g. Indial, ISDN, Rotary Groups, Extension, Tie-line circuits and the like)

T8. Installation of CSS encompassing:

- Documentation
- CPR rules
- CSS interfaces
- CPR rules for SDFs

T9. Installation and termination requirements overview encompassing:

- ACMA regulations and requirements
- Technical standards
- Programming of CSS
- Metering and Public/Pay Phones

T10. Hazards encompassing:

- Electronic components and circuits
- Printed circuit boards
- Physical
- Static discharge
- Chemical

KS02-EF102A Telecommunications Open CPR regulations

Evidence shall show an understanding of telecommunications Open CPR regulations, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Cabling provider rules encompassing:

- Cabling registrars, auditors and inspectors
- Mandatory and voluntary requirements for cabling work
- Registration

T2 General installation requirements encompassing:

- Cabling provider rules requirements
- Earth potential rise
- Catenary cabling systems
- Optical fibre and coaxial cabling systems

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REQUIRED SKILLS AND KNOWLEDGE

- Conduits
- Surge suppression devices
- T3 Cable distribution devices encompassing:
- Cable distribution devices
- Clearances
- General requirement
- T4 Indoor cabling encompassing:
- General requirements for indoor cabling
- Required minimum clearances
- Damp situations
- Cables in lift and hoist shafts
- T5 Underground cabling encompassing:
- Requirements for underground cabling
- Protection of underground cabling
- Segregation from other services
- T6 Aerial cabling encompassing:
- Requirements for aerial cabling
- Minimum clearances
- Segregation requirements
- T7 Earthing encompassing:
- Earthing systems
- Earthing of equipment
- Equipotential bonding
- T8 Miscellaneous regulations encompassing:
- Cabling in heritage buildings
- Cabling in public places
- Cabling in hazardous areas

KS03-EF102A Telecommunications installation practices

Evidence shall show an understanding of telecommunications installation and maintenance practices, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Telecommunication cable types encompassing:

- Construction
- Characteristics
- Applications

T2 Cable identification encompassing:

- Plans and drawing
- Labelling
- Documentation

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REQUIRED SKILLS AND KNOWLEDGE

T3 Building structures, materials and sequencing encompassing:

- Building types
- Timber frame
- Brick veneer
- Double brick
- Metal frame
- Parts of a building
- Sequence of construction
- Stages of construction where electrical work is completed
- Environmental and heritage awareness purpose and regulations

T4 Cable installation encompassing:

- Hazards
- Cable damage prevention
- Cable dispensers
- Cable enclosures
- Types
- Fixing
- Regulations
- Distribution boxes and back mounts
- Systems

T5 Termination Boundaries and devices encompassing:

- Electrical connections
- Hazards
- Regulations

T6 Cable preparation and terminations and hauling mechanisms encompassing:

- Indoor Methods
- Outdoor Methods

T7 Earthing concepts encompassing:

- MEN System
- Communication Earthing System
- Telecommunication Reference Conductor
- Earthing Cable Shield
- Testing
- Earth Barriers
- Purpose of earth testing instruments
- Earth Potential Rise
- Earthing test procedures
- Interpretation of results

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REQUIRED SKILLS AND KNOWLEDGE

T8 Surge suppression and system encompassing:

- Purpose
- Types
- Operation
- Installation Techniques
- Earthing requirements

T9 Cable shielding and interference encompassing:

- EMI/RFI Principles
- Sources
- Reduction Techniques
- Earthing Cable Shields

T10 Telecommunication earthing systems encompassing:

- Hazards
- Solutions
- Installation
- Termination
- Line taps
- Testing

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Lay and connect cables for multiple access to telecommunication services as described in 8) and including:

A	Terminating systems at both distributor and outlet locations and at least one 50 pair copper cable, with accurate completion of installation records, drawing alterations and compliance forms
B	Placing of cables on support structures and building faces for both internal and external locations
C	Securing cables correctly for above locations
D	Avoiding cable damage such as crushing, burning, kinking, sheath twist, cutting and nicking, bending radius
E	Reading and interpreting drawings related to cable layouts, outlet location, cable coding system and identifiers, distributor locations
F	Conducting and interpreting cable test results
G	Correctly interpreting and applying standards and regulations
H	Completing the required documentation
I	Dealing with unplanned events by drawing on

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essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to laying and connecting cables for multiple access to telecommunication services.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to cable laying and connecting applicable to larger commercial and industry installations involving many lines, multi-pair cables, backbone cabling, multi-story buildings and more complicated termination modules and distributors.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF103A Install and maintain telecommunication cabling for services in lifts

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and maintenance of telecommunications cabling in lift installations. It encompasses working safely and to Australian Communications and Media Authority's 'Lift' Cabling Provider Rule, installing multiple telephone line, multi-pair cables, backbone cabling, terminating in socket outlets, termination modules and distributors, testing and compliance checks and completing cabling documentation.

Application of the Unit

Application of the Unit **2)**

This unit applies to customer cabling terminated on distributors and to the installation, maintenance and modification of indoor, external, underground cabling Customer cabling, for the purpose of this standard, may be used to connect devices for a range of applications, including for example: telecommunications (phones and facsimile), data including video and multimedia, security and alarms, and fire protection.

Licensing/Regulatory Information

License to practice **3)**

This unit meets the minimum ACMA 'prescribed level of

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License to practice **3)**

knowledge and skill that safeguards matters of health, safety, network integrity and addresses matters of interoperability where customer equipment and standard telephone service are involved'. Therefore, skills and knowledge described in this unit may only be practised under the requirements set out in ACMA 'Lifts' Cabling Provider Rule.

Practice of this competency standard unit is also subject to regulations directly related to occupational health and safe and contracts of training where they apply.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits

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Prerequisite Unit(s) **4)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG116A	Diagnose and rectify faults in lifts systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install and maintain cabling in lifts	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
		1.2	Health and safety risks are identified and established risk control measures and procedures are followed in preparation for the work.
		1.3	Remote power feeding is identified and established risk control measures prepared.
		1.4	The nature and location of the work is determined from documentation or in discussion with appropriate person(s) to establish the scope of work to be undertaken.
		1.5	Cable routes are planned within the constraints of the building structure, significants and regulations.
		1.6	Earthing requirements are determined with consideration of existing earthing

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ELEMENT	PERFORMANCE CRITERIA	
		arrangements, where applicable and of cable system earth upper and lower resistance limitations.
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
	1.8	Sources of materials that may be required for the work are established in accordance with established routines and procedures.
	1.9	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Install and maintain cabling in lifts.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Installed support structure is checked to ensure cable will not be exposed to damage during installation and general operation.
	2.3	Catenary supports are secured to building structure and tensioned where necessary to ensure cable weight can be carried in operating conditions with interference and safety segregation maintained including adherence to AS/ACIF S009.
	2.4	Protective earthing of metal work is installed in accordance with requirements and to industry standards.
	2.5	Cables/wires are handled in accordance with manufacturer application specifications including tension and bending stress requirements.
	2.6	Control cubicles, travelling cable supports, junction boxes, line isolator units, back-mount and outlet layout conforms to manufacturer specifications and allows adequate work space for ease of access and avoid overlaying and segregation incoming and outgoing cables.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Sufficient excess is allowed at cable ends to facilitate termination.
	2.8	Telecommunication outlet ends of cable are uniquely labelled to match identifier at originating location.
	2.9	Cable is placed and secured to maintain safety and interference segregation in accordance with legislative and industry standards.
	2.10	Cable ties not tightened to the point of causing cable sheath damage or transmission impairment are trimmed flush to prevent risk of personal damage.
	2.11	Cables installed as catenaries or supported by catenaries in external environment shall meet minimum above ground clearances and clearances from hazardous electrical services as per AS/ACIF S009.
	2.12	Travelling cables installed and secured to maintain safety and in accordance to relevant legislative, industry and manufacturer's standards.
	2.13	Local Isolation Units are fitted as required by TS001 and AS/ACIF S009.
	2.14	Over-voltage protection devices are fitted to all cable pairs, where required, to suppress voltage surges with the devices protectively earthed in accordance with AS/ACIF S009.
	2.15	TRC/CES/Earth wire insulation is protected against damage and TRC/CES and protective earths segregated in accordance with relevant industry and legislative standards AS/ACIF S009.
	2.16	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.17	Cabling is installed efficiently without waste of materials and energy or damage to apparatus,

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ELEMENT	PERFORMANCE CRITERIA	
		the surrounding environment or services.
	2.18	Routine quality checks are carried out to ensure cabling complies with requirements.
3. Terminate and test cables and earth wires in lifts.	3.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Cable sheath removed to allow for correct termination length and without damage to underlying conductors and their insulation.
	3.3	Terminating modules are installed in accordance to manufacturer specifications and cable pairs neatly and sequentially fanned for termination.
	3.4	Conductors are terminated in accordance with recommended colour code sequence using appropriate termination tools in accordance with manufacturer specifications.
	3.5	Cable shield (if applicable) is earthed to manufacturer specifications and relevant industry codes of practice including AS/ACIF S009.
	3.6	Visual inspection is undertaken to confirm termination colour code sequence has been followed prior to end-to-end testing of wire and pair termination integrity.
	3.7	Cable pairs are tested and clearly labelled to provide an accurate identification in accordance with requirements.
	3.8	TRC/CES/Earth wires are terminated with connectors recommended by manufacturers in accordance with relevant industry codes of practice including AS/ACIF S009.
	3.9	TRC/CES /Earth wire continuity is maintained through out and interface requirements with electrical systems are observed.
	3.10	TRC/CES /Earthing installation is tested for continuity, insulation resistance and conductive

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ELEMENT	PERFORMANCE CRITERIA	
		resistance as per relevant industry standards including AS/ACIF S009.
	3.11	Earthing system is labelled in accordance with requirements.
	3.12	Compatibility of alterations with existing systems is confirmed and new work tested both in isolation and when integrated with existing systems.
	3.13	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	3.14	Cabling is terminated efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or services.
	3.15	Routine quality checks are carried out and a defect rectified to ensure cabling complies with requirements.
4 Complete cabling work, records and reporting.	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.
	4.3	Record sheets and plans of cable location, type and infrastructure are accurately created or updated and stored in accordance with customer requirements.
	4.4	Cable pair record books are created or updated to provide an accurate record of pair locations, inter-connections and usage in accordance with industry codes of practice and AS/ACIF S009.
	4.5	Cabling completion advice is documented and reported in accordance with requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining cabling for telecommunication services in lifts.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF103A Telecommunications Installation and Maintenance Practices for Lifts

Evidence shall show an understanding of telecommunications installation and maintenance practices for lifts, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Lift telecommunications cabling Regulations and Standards

- Registration of Cablers
- Standards
- Record keeping (cable records
- Lift boundary

T2. Lift telecommunication cables and termination methods

- Cables identification
- Types of cables
- Round travelling cable
- Flat travelling cable
- Cable wire identification
- colour codes

T3. Installation methods of communication cabling

- Requirements
- Installation techniques
- Cabling installation equipment
- Cable drawing and hauling techniques
- Cable installation and cable stripping
- Termination
- Solder
- Screw
- Insulation crushing screw
- Insulation displacement
- Segregation
- Cable protection methods

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REQUIRED SKILLS AND KNOWLEDGE

T4. Testing of communication cabling

- Types of tests
- Continuity
- Correct sequence
- Revised pair
- Transposed or split pair
- Insulation resistance
- Test equipment

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

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  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain cabling for telecommunication services in lifts as described in 8) and including:

A	Terminating travelling cables at termination devices and outlet locations with accurate completion of installation records, drawing alterations and compliance forms
B	Placing of cables on support structures and building faces for both internal and external locations
C	Securing cables correctly for above locations
D	Securing trailing cables
E	Avoiding cable damage such as crushing, burning, kinking, sheath twist, cutting and nicking, bending radius
F	Reading and interpreting drawings related to cable layouts, outlet location, cable coding system and identifiers, distributor locations
G	Conducting and interpreting cable test results
H	Correctly interpreting and applying standards and regulations
I	Completing the required documentation
J	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice

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using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and maintaining cabling for telecommunication services in lifts.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing and maintaining cabling for telecommunication services in lifts.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF104A Install and modify performance data communication copper cabling

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the installation and termination of high performance data copper cabling in buildings and premises and intended for connection a telecommunications network. It encompasses working safely and to standards, installing multiple data lines and backbones using structured twisted pair cabling, terminating at distributors, termination modules and in socket outlets, testing and compliance checks and completing cabling documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a registration to practise in the workplace subject to requirements set out ACMA ‘Open’ Cabling Provider Rule. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of

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License to practice **3)**

training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and/or modify copper cabling.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Installation or modification of wiring is prepared in consultation with others affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or in discussion with appropriate person(s) to establish the scope of work to be undertaken.
	1.6	Cable routes are planned within the constraints of the building structure, fire walls, cultural/heritage requirements and regulations.
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
	1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
	1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.10	Preparatory work is checked to ensure no damage has occurred and that it complies with requirements.
2 Install copper cables or modify.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Cables are installed or modification to comply with manufacturer specifications, technical standards and job requirements with sufficient excess to affect terminations.
	2.3	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.5	Ongoing checks of the quality of installed or modified wiring are undertaken in accordance with established procedures.
	2.6	Cable installation/modification is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3 Terminate copper cables.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Cable termination work area is cleaned and safety measure implemented.
	3.3	Cables are prepared for termination in accordance with manufacturer specifications and technical standards.
	3.4	Over voltage protection devices are fitted to cables with metallic components.
	3.5	Cable shields are earthed in accordance with manufacturer specifications and technical standards.
	3.6	Twist ratio of structured metallic cables is maintained in accordance with manufacturer specifications and technical standards.
	3.7	Twisted pair cables are terminated in accordance with manufacturer specifications and technical standards.
	3.8	Cable performance tests are conducted accurately and results documented.
	3.9	Causes of defects indicated by test results are identified and rectified.
	3.10	Unexpected situations are dealt with safely and with the approval of an authorised person.

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ELEMENT	PERFORMANCE CRITERIA	
	3.11	Ongoing checks of the quality of installed wiring are undertaken in accordance with established procedures.
	3.12	Cable terminations are carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
4 Document and verify copper cabling installation and performance.	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.
	4.3	Final checks are made to that the installed cabling conforms to requirements.
	4.4	Documentation certifying system performance is issued to an appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and modifying performance data communication structured cabling.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF104A Copper communication cable installation and modification practices

Evidence shall show an understanding of copper communication cable installation and modification practices, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Telecommunication cable types

- construction
- characteristics and
- applications

T2. Cable identification

- plans and drawing
- labelling
- documentation

T3. Cable installation

- Hazards
- Cable damage prevention
- Cable dispensers

T4. Building construction

- Domestic buildings
- Commercial buildings

T5. Fixing devices

- Bracketed assemblies
- Hard wall fixing devices
- Soft wall fixing devices
- Ties

T6. Cable enclosures

- Types
- Fixing
- Regulations

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REQUIRED SKILLS AND KNOWLEDGE

T7. Distribution boxes and back mounts

- Systems
- Termination Boundaries and devices

T8. Electrical connections

- Hazards
- Regulations

T9. Cable preparation and terminations and hauling mechanisms

- Indoor Methods
- Outdoor Methods

T10. Category 5 and 6 structured cabling

- design principles

T11. Category 5 and 6 structured cabling installation systems

- coaxial cable construction
- uses
- requirements

T12. Category 5 and 6 structured cabling performance requirements

- approved practices
- safety requirements
- connectors
- terminating tools
- continuity tests
- fault diagnosis
- recording results

T13. Selecting cable and cabling hardware

- cable characteristics
- higher performance cable types
- requirements of Australian Standards

T14. Testing Category 5 and 6 cabling

- Testing

T15. Local area network cabling systems

T16. Coaxial cables

- Coaxial cables
- Coaxial cable installation systems
- Twisted pair cable installation systems

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and modify performance data communication structured cabling as described in 8) and including:

A Reading and interpreting drawings related to cable layouts, cable schedules and apparatus locations.

B Routing, placing and securing cables to comply with requirements

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C	Maintaining fire integrity
D	Preparing and terminating each type of cable to comply with requirements.
E	Conducting cable performance test accurately
F	Identifying and rectifying anomalies
G	Completing the necessary documentation accurately.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and modifying performance data

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communication structured cabling.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEF109A	Install and connect data and voice communication equipment

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing and modifying performance structured metallic cables each on at least two occasions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF105A Install and modify optical fibre performance data communication cabling

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the installation and modification of high performance data communication optical fibre cabling in buildings and premises and intended for connection a telecommunications network. It encompasses working safely and to standards, installing multiple data lines and backbones using optical fibre cabling, terminating at distributors, splices and on socket outlets, testing and compliance checks and completing cabling documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a registration to practise in the workplace subject to requirements set out ACMA 'Open' Cabling Provider Rule. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment

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Prerequisite Unit(s) **4)**

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install or modify optical fibre cabling	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Health and safety risks are identified and established risk control measures and procedures are followed in preparation for the work.
		1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
		1.4	Installation or modification of wiring is prepared in consultation with others affected by the work and sequenced appropriately.
		1.5	The nature and location of the work is determined from documentation or in discussion with appropriate person(s) to establish the scope of work to be undertaken.
		1.6	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
		1.7	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
		1.8	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.9	Preparatory work is checked to ensure no damage has occurred and that it complies with requirements.
2	Install or modify optical fibre cables	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Optical fibres are tested for optical continuity.
		2.2	Cables are installed or modification to comply with manufacturer specifications, technical standards and job requirements with sufficient excess to affect terminations.
		2.4	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and

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ELEMENT	PERFORMANCE CRITERIA	
		documented.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Ongoing checks of the quality of installed wiring are undertaken in accordance with established procedures.
	2.7	Cable installation/modification is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3 Terminate optical fibre cables.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Cable termination work area is cleaned and safety measure implemented, particularly for terminating optical fibre cables.
	3.3	Cables are prepared for termination in accordance with manufacturer specifications and technical standards.
	3.4	Optical fibre connectors are fitted in accordance with manufacturer specifications and technical standards.
	3.5	Appropriate methods are used to splice optical fibre cables in strict accordance with OHS safety measures, manufacturer specifications and technical standards.
	3.6	Cable performance tests are conducted accurately and results documented.
	3.7	Causes of defects indicated by test results are identified and rectified.
	3.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	3.9	Ongoing checks of the quality of installed wiring are undertaken in accordance with established procedures.
	3.10	Cable terminations are carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
4 Document installation or modification, and verify data communication optical fibre cabling performance.	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.
	4.3	Final checks are made to that the installed cabling conforms to requirements.
	4.4	Documentation certifying system performance is issued to an appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and modifying performance data communication optical fibre cabling.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies..

KS01-EF105A Optical fibre cable installation and modification practices

Evidence shall show an understanding of optical fibre communication cable installation and modification practices, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Telecommunications Standards and Regulations

- Telecommunications Wiring Rules AS/ACIF S009 or its replacement.
- Telecommunications Equipment Standards AS/ACIF S008 or its replacement.
- Cabling Provider Rules.

T2. Risk Management Principles with respect to:

- laser and similar products.
- optical fibre products.
- low voltage and extra low voltage circuits.
- working in hazardous areas.

T3. Optical Fibre Safety - Laser

- AS/NZS 2211.1 Safety of laser products
- AS/NZS 2211.2 Safety of optical fibre communications systems (OFCS)
- Nature of intense light outside of the visible light spectrum.
- Safety precautions to be employed when working with intense light sources.
- Laser classifications and their typical uses

T4. 4. Optical Fibre Safety - Hazards

- Chemicals used in the installation and termination process including Isopropyl Alcohol, Acetone, Kerosene, Mineral Turpentine and other solvents.
- Epoxy resins and other adhesives.
- Hot surface precautions.
- Disposal of hazardous materials including sharps (syringes glass shards and the like).
- Working in confined spaces and at height.

T5. Optical Theory

- Electromagnetic Spectrum and the place of visible light, infrared and ultra violet

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REQUIRED SKILLS AND KNOWLEDGE

bands.

- Frequency of oscillation and the relationship to wavelength of light.
- Propagation speed and the refractive index.
- Reflection of light and refraction of light.

T6. Optical Fibre Principles of Operation

- Multi Mode Optical Fibres (MMOF)
- Single Mode Optical Fibres (SMOF)
- Advantages and applications
- Refractive index and how it can be employed in optical fibres.
- Transmission path for laser energy within the optical fibre.
- Optical fibre performance and the mechanisms that may result in losses.
- Requirements of optical fibre cables as specified in current Standards

T7. Installation of Cables

- Requirements of the standard AS/ACIF S009 or its replacement.
- AS/NZS 3080 or its replacement.
- Installation requirements of cables by the manufacturer.
- Building Codes of Australia.
- Construction of domestic, commercial and industrial buildings.
- Purpose and procedures for pre-testing optical fibre cable prior to installation
- Bending radii and hauling requirements.
- Cable supporting structures, cable trays and catenaries
- Types of securing devices and anchors.
- Safety precautions

T8. Terminating Fibre Cables

- Precautions required for the use of solvents and cleaning agents.
- Safe handling and disposal of waste materials at the conclusion of termination.
- Safe handling of fibre cables that may carry laser light energy.
- Manual means of striping and cleaning optical fibre cables.
- Optical devices to safely examine optical fibre cables.
- Mechanical means to terminate or splice optical fibre cables
- Termination devices and methods
- Preparation and splicing techniques.
- Devices used to protect terminations and splices against mechanical damage.
- Colour individual fibre cables and tubes to ensure end to end integrity.

T9. Testing optical fibre cables.

- AS/NZS 3080 Telecommunications Installations
- Concept of measurements in decibels.
- Loss measurements methods at different wavelengths of light

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REQUIRED SKILLS AND KNOWLEDGE

- Setting up required equipment for accurate testing and the calibration of that equipment.
- Precautions employed to ensure accurate measurements.
- Operating principles and applications of an Optical Time Domain Reflectometer (OTDR).
- Operating principles and applications of an visible light source and an optical light loss test set
- Extraction and recording of test reports.
- Analyse and interpretation of test reports and corrective action.

T10. Building Construction and the building codes.

- Building Codes of Australia
- Construction of domestic, commercial and industrial buildings

T11. Supporting structures and fixings

- Types of cable supporting structures, cable trays and catenaries
- Types of securing devices for anchoring cable trays and catenaries.

T12. Administration and management (records)

- Completion Compliance Certificate (TCA1)
- Contractual obligations for the provision of test results and reports to customers.
- Requirements to keep and make available copies of test results of individual fibres.
- Requirements to record cable pathways and locations of coiled extra cable length for expansion or re-termination.
- Requirements of labelling Frames, Cabinets and outlets.
- Requirements of record keeping for cross connects and patches.
- How to plan records indicating history of faults or deficiencies attributed to the fibre cable to plan replacement or maintenance.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and modify performance data communication optical fibre cabling as described in 8) and including:

A Reading and interpreting drawings related to cable layouts, cable schedules and apparatus locations.

B Routing, placing and securing cables to comply with requirements

C Maintaining fire integrity

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D	Preparing and terminating each type of cable to comply with requirements.
E	Conducting cable performance test accurately
F	Identifying and rectifying anomalies
G	Completing the necessary documentation accurately.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and modifying performance data communication optical fibre cabling

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEF109A	Install and connect data and voice communication equipment

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing or modifying two types of performance optical fibre cables each on at least two occasions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF106A Solve problems in voice and data communications circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers providing known solutions to predictable problems in single and multiple path circuits operated at extra-low voltage as they apply to various voice and data communications work functions. It encompasses working safely, problem solving procedures, including the use of basic voltage, current and resistance measuring devices, providing known solutions to predictable communication circuit problems.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in electrotechnology and may be used in school based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However they are subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on extra-low voltage voice and data communications circuits	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve problems in extra-low voltage voice and data communications circuits	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established routines are used to solve circuit problems using measured and calculated values

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ELEMENT	PERFORMANCE CRITERIA	
		as they apply to single path, single source circuits.
	2.5	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established routine procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in extra-low voltage voice and data communications circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF106A Electrotechnology communication principles

Evidence shall show an understanding of electrotechnology communication principles, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. The basic electrical circuit

- basic circuit components
- function of basic circuit components
- connection of components
- measurement of circuit parameters
- open-circuit, closed-circuit and short-circuits.

T2. Circuit parameter relationships

- Ohms Law
- calculation of voltage, current and resistance
- power dissipated
- calculation of power.

T3. Measurement instruments (voltage, current & resistance)

- safe working procedures
- handling and storing instruments
- selecting and set up of instruments
- connecting instruments
- read analogue scales and digital readouts.

T4. Effects of electrical current

- physiological effect
- heating effect
- magnetic effect
- chemical effect
- typical uses

T5. EMF sources

- basic generator
- basic thermocouple

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REQUIRED SKILLS AND KNOWLEDGE

- photovoltaic cells
- piezo electric
- primary and secondary cells.

T6. D.C. resistive circuits

- series circuits (set-up, measurement and calculations)
- parallel circuits (set-up, measurement and calculations)
- series-parallel circuits (set-up, measurement and calculations).

T7. Capacitance

- construction of capacitors
- operation of capacitors
- units
- charge of a capacitor
- RC series circuit.

T8. Magnetism and electromagnetic induction

- permanent magnets
- electromagnetism
- induced emf
- inductors
- principles of inductance
- unit of inductance
- electromagnetic radiation (EMR)
- cross talk.

T9. A.C. principles

- generation of sinusoidal voltage
- a.c. circuit parameters – frequency, period, amplitude, instantaneous value, maximum value, peak value, peak to peak value and rms value
- calculation of frequency and rms values
- effects of frequency on inductors
- effects of frequency on capacitors
- transformers construction and operating principles.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in solving problems in extra-low voltage data and voice communications circuits as described in 8) and including:

A Determining the operating parameters of an existing circuit.

B Determining the frequency response of existing circuits

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C	Altering an existing circuit to comply with specified operating parameters.
D	Developing circuits to comply with a specified function and operating parameters.
E	Identifying earth faults.
F	Identifying loss of supply.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solve problems in extra-low voltage voice and data communications circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

Single source single and multiple path communication circuits as they apply to problems related to installation, fault finding, maintenance or development work functions in any of the following disciplines:

- Voice and Data Communications
- Electronics
- Fire protection
- Renewable and sustainable energy systems, and
- Security technology
- In relation to at least three of the following types of communication circuit problems and on at least two occasions:
- Determining the operating parameters of an existing circuits
- Determining the frequency response of an existing circuits
- Identifying and locating open-circuits
- Identifying and locating short-circuits
- Identifying earth faults
- Identifying loss of supply

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF107A Set up and configure the wireless capabilities of communications and data storage devices

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers entering instructions in wireless devices with simple built-in programming function and verifying that the device operates as intended. It encompasses safe working practices, checking device software installation, following written and oral instruction and procedures and completing necessary documentation.

Note: Examples of wireless devices are personal digital assistants(PDAs), mobile phones, personal computers(PCs) remote controls etc

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a registration to practise in the workplace subject to requirements set out ACMA ‘Open’ Cabling Provider Rule. Practice in workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to enter operating instructions.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are reported and advise on risk control measures are sought from the work supervisor.
	1.4	Work supervisor or customers are consulted to determine which functions of the device are to be use and the parameter of each.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Device installation is checked for compliance with job specification and regulations where they apply.
2 Enter operating instructions.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	The required status of each function of the device is entered and their parameters set in accordance with manufactures programming instructions.
	2.4	Entered data are checked as meeting those specified by the work supervisor or customer.
	2.5	Procedures for referring non-routine events to immediate supervisor for directions are followed.
3 Test device operation and report.	3.1	Device operation is tested in strict accordance OHS requirements and procedures.
	3.2	Operating anomalies are identified and corrected in accordance with established routines.
	3.3	OHS work completion risk control measures and procedures are followed.
	3.4	Work site is cleaned and made safe in accordance with established procedures.
	3.5	Work completion is reported and appropriate person(s) notified in accordance with established routines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and set up and configuring the wireless capabilities of communications and data storage devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies..

KS01-EF107A **Wireless devices**

Evidence shall show an understanding of wireless devices, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Types and applications

T2. Operating principles at sub-system level

T3. Programming functions

T4. Networking set up

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work

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environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control

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measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up the wireless capabilities of communications and data storage devices as described in 8) and including:

A	Understanding required operating functions and parameters.
B	Identifying non-compliance conditions of device installation.
C	Entering functions and parameters correctly.
D	Correcting programming anomalies.
E	Testing and verify device operation.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up the wireless capabilities of communications and data storage devices.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to entering and verifying operating instruction in at least two types of microprocessor equipped devices with built-in icon-based programmable functions such as programmable relays, timers, temperature controllers, detection devices for security and fire.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF108A Select and arrange equipment for wireless communication networks

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers selecting and arranging of wireless access devices, routers and switches for local area and wide area networks intended for connection to a telecommunications network. The unit encompasses selecting compliant equipment, developing LAN/WAN arrangements that comply with regulation, based on calculated and deemed-to-comply solutions and completing network documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired and is therefore not applicable to those entering work.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to select equipment.	1.1	The extent and nature of the communications network is determined from job specifications.
	1.2	Safety and other regulatory requirements to which the wireless network area shall comply are identified, obtained and understood.
2 Arrange locations of equipment and cable routes.	2.1	Location of equipment is arranged to comply with job specifications and regulatory requirements.
	2.2	Cable routes are planned to ensure maximum lengths specified by standards and the manufacturer are not exceeded.
	2.3	Cable routes are planned to comply with job specifications and regulatory requirements.
	2.4	Earthing is arranged to comply with job specifications and regulatory requirements.
3 Select cables and equipment.	3.1	Cables types are selected for suitability for the environments in which they are to be installed, performance required, and regulatory requirements.
	3.2	Cable sizes are selected to meet capacity and performance requirements.
	3.3	Earthing components are selected to meet regulatory and earthing requirements.
	3.4	Evidence is obtained that network equipment selected complies with safety requirements.
	3.5	Electronic equipment types are selected for

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ELEMENT	PERFORMANCE CRITERIA	
		suitability for the environments in which they are to be installed, performance required, and regulatory requirements.
4 Document communications network.	4.1	Reasons for selections made, including calculations, are documented in accordance with established procedures.
	4.2	Wireless networks equipment for arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and selecting and arranging equipment for wireless networks.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF108A Wireless network equipment, selection and arrangements

Evidence shall show an understanding of wireless network equipment selection and arrangements, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Operating systems and networks

- Operating system fundamentals
- Networking fundamentals
- Physical components of a network
- Transmission Control Protocol / Internet Protocol (TCP / IP) encompassing:
- Network Services
- Network Operating Systems
- Installation and boot processes

T2. Wireless network components for local area and wide area networks

- Types of devices, routers , switches and cables
- Construction and operating principles
- Selection of compliant components and cables

T3. Wireless network configurations

- LAN/WAN arrangements and component locations
- Cable routing
- Earthing
- Compliance with job specifications and regulation/s
- Calculated and deemed-to-comply solutions and completing network documentation.

T4. Wireless network security

T5. Wireless network documentation

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

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REQUIRED SKILLS AND KNOWLEDGE

- Established procedures and appropriate person(s).
- Reasons for selections made, including calculations
- Wireless networks equipment for arrangement and specifications for all selected items

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

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Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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- Select and arrange equipment for wireless networks as described in 8) and including:

A	Arranging network to comply with safety and other regulatory and functional requirements
B	Selecting appropriate types and sizes of cables
C	Arranging network equipment
D	Selecting appropriate earthing components
E	Documenting installation arrangement, specification for items selected and reasons for the selections made
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to selecting and arranging equipment for wireless networks.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Nil

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to selecting and arranging equipment for wireless networks comprising a representative range of network wireless components.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF109A Install and connect data and voice communication equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation, termination and setting up of data and voice equipment for high performance LANs in buildings and premises and intended for connection to a telecommunications network. It encompasses working safely and to standards, installing hubs, routers, switches, decoders, PABXs connected by structured, coaxial and optical fibre cabling, and completing network documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a registration to practise in the workplace subject to requirements set out ACMA ‘Open’ Cabling Provider Rule. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of

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License to practice **3)**

training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical communications equipment and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services

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Prerequisite Unit(s) **4)**

UEENEEF104A	Install and modify performance data communication copper cabling
UEENEEF105A	Install and modify optical fibre performance data communication cabling

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install communications equipment and associated equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Health and safety risks are identified and established risk control measures and procedures are followed in preparation for the work.
		1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
		1.4	Installation of communications equipment is prepared in consultation with others affected by the work and sequenced appropriately.
		1.5	The nature and location of the work is determined from documentation or in discussion with appropriate person(s) to establish the scope of work to be undertaken.
		1.6	A location of communications equipment and associated equipment is planned within the constraints of the building structure, significants and regulations.
		1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
		1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
		1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.10	Preparatory work is checked to ensure no damage has occurred and that it complies with requirements.
2	Install communications equipment and associated equipment.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Tests are carried out in strict accordance with OHS established safety procedures.

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ELEMENT		PERFORMANCE CRITERIA	
		2.3	Communications equipment is installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance.
		2.4	Cabling is terminated at communications equipment in accordance with manufacture's specifications and functional and regulatory requirements.
		2.5	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Ongoing checks of the quality of installed communications equipment are undertaken in accordance with established procedures.
		2.8	Communications equipment installation is carried out efficiently without waste of materials or damage to communications equipment, circuits, the surrounding environment or services and using sustainable energy principles.
3	Completion and report installation activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Final checks are made to ensure that the installed communications equipment conforms to requirements.
		3.4	'As-installed' communications equipment is documented in accordance with requirements and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and connecting voice and data communications equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF109A Voice and Data Communication Equipment

T1. Analogue and digital signals encompassing:

- How information is carried
- Signal distortion

Examples include attenuation, reflection, noise, dispersion, jitter, latency and collisions

T2. Types of networks, network components and hardware

T3. Local Area Network (LAN) architectures

T4. Networking protocols and the OSI model

T5. Network signal propagation

T6. Transmission Control Protocol / Internet Protocol (TCP/IP)

T7. Basics of Encoding Networking Signals

T8. Internet services

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and connect voice and data communications equipment as described in 8) and including:

A Reading and interpreting drawings related to and communications equipment locations and connections.

B Placing and securing communications equipment accurately

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C	Maintaining fire integrity
D	Connecting communications equipment to comply with requirements
E	Completing the required documentation accurately
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and connecting voice and data communications equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit

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applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEF104A	Install and modify performance data communication copper cabling
UEENEEF105A	Install and modify optical fibre performance data communication cabling

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing and connecting at least 5 different types of voice and data communications equipment terminating three types of communications cable.

Note:

1. Examples of communications equipment are distribution frames, hubs, routers, switches, decoders, PABXs and the like

2. Example of connecting cables are by structured cable, coaxial cables and optical fibre cabling.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF110A Select and arrange data and voice equipment for local area networks

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers selecting and arranging data and voice communication cabling routes, socket outlets, termination modules, switches, routers and distributors in LANs intended for connection to a telecommunications network. The unit encompasses selecting compliant equipment, developing LAN arrangements that comply with regulation, based on calculated and deemed-to-comply solutions and completing network documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired and is therefore not applicable to those entering work.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services
UEENEEF104A	Install and modify performance data communication copper cabling
UEENEEF105A	Install and modify optical fibre performance data communication cabling

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to select equipment.	1.1	The extent and nature of the communications network is determined from job specifications.
		1.2	Safety and other regulatory requirements to which the communications network area shall comply are identified, obtained and understood.
2	Arrange locations of equipment and cable routes.	2.1	Location of equipment is arranged to comply with job specifications and regulatory requirements.
		2.2	Cable routes are planned to ensure maximum lengths specified by standards and the manufacturer are not exceeded.
		2.3	Cable routes are planned to comply with job specifications and regulatory requirements.
		2.4	Earthing is arranged to comply with job specifications and regulatory requirements.

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ELEMENT		PERFORMANCE CRITERIA	
3	Select cables and equipment.	3.1	Cables types are selected for suitability for the environments in which they are to be installed, required performance and regulatory requirements.
		3.2	Cable sizes are selected to meet capacity and performance requirements.
		3.3	Earthing components are selected to meet regulatory and earthing requirements.
		3.4	Evidence is obtained that network equipment selected complies with safety requirements.
		3.5	Electronic equipment types are selected for suitability for the environments in which they are to be installed, required performance and regulatory requirements.
4	Document communications network.	4.1	Reasons for selections made, including calculations, are documented in accordance with established procedures.
		4.2	Communications network arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and selecting and arranging equipment for local area networks.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF110A Local Area Network equipment, selection and arrangements

Evidence shall show an understanding of Local Area Network fundamentals, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Local Area Network fundamentals

- Analogue and digital signals encompassing:
  - How information is carried
  - Signal distortion

Examples include attenuation, reflection, noise, dispersion, jitter, latency and collisions

- Types of networks, network components and hardware
- Local Area Network (LAN) architectures
- Networking protocols and the OSI model
- Network signal propagation
- Transmission Control Protocol / Internet Protocol (TCP/IP)
- Basics of Encoding Networking Signals
- Internet services

T2. PABX fundamentals encompassing:

- Programming methods
- Configuration options
- Programming options

T3. Switches, hubs and routers encompassing:

- Purpose and function
- Selection
- Circuit configurations
- Connection arrangements
- System protocols

T4. Decoders encompassing:

- Purpose and function

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REQUIRED SKILLS AND KNOWLEDGE

- Selection
- Circuit configurations
- Connection arrangements
- System protocols

T5. Coaxial cable installation and terminations encompassing:

- Coaxial cable types encompassing:
  - Structure of qualshield and trishield coaxial cables armour plated coaxial cable
  - Typical applications
  - Selection
- Coaxial cabling installation and termination encompassing:
  - Separation and segregation requirements and techniques.
  - Coaxial cable connectors compatible with the cable type and the environment
  - Installation requirements and techniques applicable to coaxial cables
  - Coaxial cable connectors and termination techniques

T6. Enterprise work activities records encompassing:

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment

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intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Select and arrange equipment for local area networks as described in 8) and including:

A	Arranging network to comply with safety and other regulatory and functional requirements.
B	Selecting appropriate types and sizes of cables.
C	Arranging network equipment.
D	Selecting appropriate earthing components.
E	Documenting installation arrangement, specification for items selected and reasons for the selections made.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to selecting and arranging equipment for local area networks.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED101A	Use basic computer applications relevant to a workplace

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to selecting and arranging equipment for local area networks comprising a distribution frame, at least 20 telecommunication and 20 data outlets PABX and server.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF111A Test, report and rectify faults in data and voice installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers testing for certification finding and repairing faults in telecommunication installations and local area networks. The unit encompasses working safely, reading cabling diagrams, performance testing, applying logical fault finding procedures, testing functionality of the network, conducting repairs and completing the necessary documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a registration to practise in the workplace subject to requirements set out ACMA ‘Open’ Cabling Provider Rule. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical communications equipment and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services
UEENEEF10	Install and modify performance data

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Prerequisite Unit(s) **4)**

4A	communication copper cabling
UEENEEF105A	Install and modify performance data communication optical fibre cabling

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to test, report and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified, and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Testing is prepared in consultation with others affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or in discussion with appropriate person(s) to establish the scope of work to be undertaken.
	1.6	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
	1.7	Material needed for the testing, reporting and rectifying work is obtained in accordance with established procedures and checked against job requirements.
	1.8	Tools, equipment and testing devices needed to for the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.9	Preparatory work is checked to ensure no damage has occurred and that it complies with requirements.
2 Test and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Tests are carried out in strict accordance with OHS established safety procedures.
	2.3	Tests are prepared and conducted in accordance with test equipment operating instructions and

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ELEMENT	PERFORMANCE CRITERIA	
		requirements.
	2.4	Cable performance tests are conducted accurately and results documented in accordance with established procedures.
	2.5	Causes of defects or faults indicated by test results are identified and rectified in accordance with established procedures.
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Ongoing checks of the quality of installed equipment are undertaken in accordance with established procedures.
	2.9	Testing and rectifying faults is carried out efficiently without waste of materials or damage to equipment, circuits, the surrounding environment or services and using sustainable energy principles.
3 Document and verify installation performance.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Service reports are completed, when necessary in accordance with established procedures.
	3.4	Documentation certifying system performance is issued to an appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing, reporting and rectifying faults in voice and data installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF111A Data and voice cabling testing devices and techniques

Evidence shall show an understanding of data and voice cabling testing devices and techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Networking fundamentals

- Analogue and digital signals encompassing:
  - How information is carried
  - Signal distortion

Examples include attenuation, reflection, noise, dispersion, jitter, latency and collisions

  - Types of networks, network components and hardware
  - Local Area Network (LAN) architectures
  - Networking protocols and the OSI model
  - Network signal propagation
  - Transmission Control Protocol / Internet Protocol (TCP/IP)
  - Basics of Encoding Networking Signals
  - Internet services

T2. Basic electrical testing and measuring devices and techniques encompassing:

- Types and applications of testing/measuring devices including voltage testers, multimeters, clamp meters, continuity testers and insulation resistance testers.
- Features of testing/measuring devices including safety, user calibration and parameter and range settings.
- Connection of test/measuring devices into a circuit
  - safety procedures
  - circuit arrangement of test/measuring devices
- Taking readings
- Storage, maintenance and care of test/measuring devices.
- Australian Standard quality assurance requirements for test equipment calibration certification.

T3. Performance parameters associated with copper cables, coaxial cables and

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REQUIRED SKILLS AND KNOWLEDGE

optical cables encompassing:

- Open circuit, short circuit and pair continuity
- Split pair and crossed pair
- Attenuation
- Return loss
- Insulation Resistance (leakage)
- Near end cross talk (NEXT)
- Attenuation to cross talk ratio (ACR)
- Loop resistance
- Noise (Impulse noise and average noise)
- Characteristic impedance

Note: Structured cabling including, twisted pair cabling, shielded twisted pair (STP), unshielded twisted pair (UTP) and higher performance cabling.

T4. Test results for compliance with required regulation, standards, and or codes for structured copper cables, coaxial; and optical fibre cables encompassing:

- Tests required to evaluate a given performance parameter
- Test equipment and leads needed to evaluate a given performance parameter.
- Operation of test equipment for correct evaluation of specific cable performance parameters and to obtain accurate and reliable results.
- Transmission performance requirements.

T5. Testing and validation of a customer premises cabling installation encompassing:

- Requirements of current Standard of site certification for high performance copper cables, coaxial cable and optical fibre cables
- Reporting requirements for the completion of work related to conformity of a cabling installation.
- Documentation required in certifying a cabling installation conforms to relevant standards and specifications.

T1. Optical Time Domain Reflectometer (OTDR) operating principles, applications and calibration procedures encompassing:

T2. Typical causes of non compliant test results.

T3. Recording, reporting and maintaining test results encompassing:

- Purpose and extent of maintaining work activities records in an enterprise
- Types of records for maintaining work activities in an enterprise
- Methods for recording and maintaining work records
- Work records required by regulation requirements

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Test, report and rectify faults in voice and data installations as described in 8) and including:

A Reading and interpreting drawings and schedules of the installation

B Preparing and conducting appropriate test accurately

C Interpreting test results correctly

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D	Identifying defects/faults from test results
E	Rectifying faults effectively
F	Completing the required documentation accurately.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing, reporting and rectifying faults in voice and data installations

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and

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incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEF104A	Install and modify performance data communication copper cabling
UEENEEF105A	Install and modify optical fibre performance data communication cabling
UEENEEF109A	Install and connect voice and data communications equipment

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to testing, reporting and rectifying faults in voice and data installations comprising two different items of customer premises equipment and a local area network.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF112A Install aerial telecommunication cables

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers installation of catenary and aerial telecommunication cables on existing post and poles. The unit encompasses working safely and to standard and specifications, installing catenary cable, fixing communication cables and completing necessary documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a registration to practise in the workplace subject to requirements set out ACMA ‘Open’ Cabling Provider Rule. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various

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License to practice **3)**

jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical communications equipment and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install aerial communication cables	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Health and safety risks are identified and established risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Cabling installation is prepared in consultation with others affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or in discussion with appropriate person(s) to establish the scope of work to be undertaken.
	1.6	Cable routes are planned within the constraints of the precinct, structure, significants and regulations.
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
	1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
	1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.10	Preparatory work is checked to ensure no damage has occurred and that it complies with requirements.
2 Install aerial communication cables.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Poles are checked for soundness in accordance with established procedures.
	2.3	Catenary cables are installed ensuring sufficient clearances are maintained in compliance with requirements.
	2.4	Cables are attached to the catenary without

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ELEMENT	PERFORMANCE CRITERIA	
		strain or damage.
	2.5	Cable ends are protected from damage in preparation for termination.
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Ongoing checks of the quality of installed aerial communication cables are undertaken in accordance with established procedures.
	2.9	Cable installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3 Document and verify cabling installation	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Documenting cable installation.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing aerial communication cables.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF112A Telecommunication aerial cabling requirements and techniques

Evidence shall show an understanding of telecommunication aerial cabling, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Hazards and control measures in aerial cabling working environment encompassing:

- Risk management and assessment of risk:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:
  - Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage encompassing:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage encompassing:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live
- Risks and control measures associated with working on aerial cables encompassing:
  - Soundness of pole for aerial cabling
  - Use of aerial safety equipment

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REQUIRED SKILLS AND KNOWLEDGE

- Procedure to apply pole top rescue

T2. Aerial construction methods and regulations

T3. Joining aerial cables

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

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Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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- Install aerial communication cables as described in 8) and including:

A	Reading and interpreting drawings related to cable schedules and routes
B	Installing catenary cables correctly
C	Attaching communications cable to catenary without damage
D	Protecting cable ends
E	Completing the necessary documentation accurately
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing aerial communication cables.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no current assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing a representative range of aerial communication cables each, on at least two occasions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF113A Install underground communication cables

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation of underground conduits and ducts and drawing-in communication cables. The unit encompasses working safely and to standard and specifications, preparing and filling trenches, placing conduits and ducts, drawing cables, and completing necessary documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a registration to practise in the workplace subject to requirements set out ACMA ‘Open’ Cabling Provider Rule. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various

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License to practice **3)**

jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical communications equipment and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install underground communication cables.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Cabling installation is prepared in consultation with others affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or in discussion with appropriate person(s) to establish the scope of work to be undertaken.
	1.6	Cable routes are planned within the constraints of the precinct, structure, significants and regulations.
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
	1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
	1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.10	Preparatory work is checked to ensure no damage has occurred and that it complies with requirements.
2 Install underground communication cables.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Trenching is checked as complying with requirements and standards.
	2.3	Ducts/conduits are laid in compliance with requirements and standards.
	2.4	Cables are drawn-in without stain of damage.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Cable ends are protected from damage in preparation for termination.
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Ongoing checks of the quality of installed wiring are undertaken in accordance with established procedures.
	2.9	Cable installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3 Document and verify installation of underground communication cables.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Documenting cable installation.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing aerial communication cables.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF113A Telecommunication underground cabling requirements and techniques

Evidence shall show an understanding of telecommunication underground cabling, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Hazards and control measures in underground cabling working environment

- Risk management and assessment of risk:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents:
  - Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Risks and control measures associated with trenches;
  - Identification of trenching conditions
  - Notification of relevant authorities/utilities and permits
  - Digging and trenching equipment safety
  - Methods of shoring
  - Public safety
  - Personal safety equipment

T2. Telecommunication below ground cabling

- Types and purposes of mechanical and manual aids.
- Purpose, location, and capacity of man holes and pits.
- Types of underground cable
- Procedure for the excavation of a site for the installation of a man hole, pit, pipe and conduit

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment

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instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install below ground communication cables as described in 8) and including:

A Reading and interpreting drawings related to cable schedules and routes

B Installing ducts/conduits below ground correctly

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C	Drawing in cables without strain or damage
D	Protecting cable ends
E	Completing the necessary documentation accurately
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing below ground communication cables.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit

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applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no current assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing a representative range of below ground communication cables each on at least two occasions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEF114A Set up and configure basic data communication systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers setting up, configuring and maintaining operation of personal computer based data communications systems. It encompasses safe working practices, installing data communications hardware, installing and configuring data communications software and documenting set-up parameters.

Note:

This unit applies to all aspects of Electrotechnology - engineering applications only. For general competencies related Information Technologies refer to the latest endorsed IT Training Package.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED102A	Assemble, set-up and test computing devices
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set up and configure basic data communication systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent of set-up and configuration work is determined from job specifications and in consultation with appropriate person(s).
	1.3	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.4	Hardware and software needed for the work are obtained in accordance with established procedures and checked against job requirements.
	1.5	Preparatory work is checked to ensure no damage has occurred and that it complies with requirements.
	1.6	OHS processes and procedures for a given work area are identified, obtained and understood.
2 Set up, configure and maintain basic data communication equipment.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Layout of data communications hardware, cabling and outlets is determined from job specifications or in consultation with appropriate person(s).
	2.3	Hardware is installed in accordance with the data

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ELEMENT	PERFORMANCE CRITERIA	
		communications system requirements. (Note 1)
	2.4	Data communications software is in installed and configured in accordance with network requirements. (Note 2)
	2.5	Data communications operations are tested and anomalies identified and corrected.
	2.6	Reported data communications failures and faults are responded to and appropriate tools and methods are used.
	2.7	Identified causes of reported problems are rectified and the data communications link is tested in accordance with established procedures.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.9	Set-up configuration and maintenance are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete work and document activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Data communications configuration and maintenance records are maintained in accordance with established procedures.
	3.4	Service report is completed and forward to appropriate person(s) in accordance with established procedures.

Notes.

1. Examples of hardware include cables and connectors, dial up modems, and cable modems.

2. Examples of configuration include data communications protocols, user options and permissions, security, driver software.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and in setting up and configuring basic data communications systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF114A Data communication fundamentals

Evidence shall show an understanding of data communication fundamentals, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Process of data transmission encompassing:

- codes used in data communications
- asynchronous and synchronous transmission
- bits per second and baud rate
- DCEs and DTEs.
- error control, parity and CRC.

T2. Characteristics and limitations of the types of transmission media encompassing:

- information as a quantity.
- information content of symbols.
- redundancy in communications.
- common types of media used in data communications: twisted pair, coaxial.
- other communication systems: HF radio, satellite and cellular.

T3. Simple protocols encompassing:

- reason for protocols.
- simple protocols: teletype, X modem, half-duplex and full duplex.

T4. Types, characteristics and limitations of modems and interface standards encompassing:

- operation and types of modems
- Note: Examples include serial, parallel, USB, firewire, broadband, ADSL, cable modems
- modulation techniques: FSK, PSK and QAM.
- interface and signalling standards:

  Note: Examples include RS232, V.24, Current loop, RS422, RS423, RS449, RS485, V35, X21 and G703.
- Limitations interface standards, speed and distance.

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REQUIRED SKILLS AND KNOWLEDGE

T5. Types, characteristic specifications and limitations of fibre optic systems encompassing:

- fundamentals of light and how it travels in a fibre.
- typical fibre composition, multimode and single mode propagation
- laser and other light sources and detectors.
- fibre cable and splice fibre cable.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

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equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up and configure basic data communications systems as described in 8) Range: and including:

A	Establishing the extent of work schedule.
B	Obtaining specified hardware and software according to the work.
C	Laying out network in accordance with requirements.
D	Installing hardware as specified.
E	Installing and configuring software to requirements.
F	Identifying and correcting anomalies.
G	Finding the cause of faults/malfunctions.
H	Rectifying the cause of malfunctions.
I	Documenting network configurations and activity results for future referencing.
J	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal

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learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up and configuring basic data communications systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to setting up and configuring basic data communications systems that include:

- Standard serial and parallel ports
- High-speed ports (e.g. USB, Firewire)
- 1 dial-up modem
- 1 broadband modem

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Computer Systems

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UEENEEF115A Assemble and connect telecommunication frames and cabinets

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers assembly and connection of telecommunication frames and cabinets. The unit encompasses working safely, following standards, specifications and component/ manufacturer requirements, matching equipment with that specified, terminating and connecting communication wiring and completing necessary documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in a workplace specifically for the purpose of assembling and connecting communication frames and cabinets. In other skills and knowledge described in this unit may only be practised under the requirements set out in ACMA 'Open' Cabling Provider Rule. In addition, practice in this unit is subject to regulations directly related to occupational health and

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License to practice **3)**

safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assemble and connect telecommunication frames and cabinets	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	Work instructions, including layout and wiring diagrams, are identified, obtained and understood.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Materials required for the work are obtained in accordance with established routines and procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Assemble and connect telecommunication frames and cabinets	2.1	Established OHS risk control work measures are followed.
	2.2	Equipment is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Frames/cabinets and communication components are fitted in accordance with work instructions, standards and established routines.
	2.4	Interconnections are made in accordance with work instructions, standards and established routines.
	2.5	Routine quality checks are carried out in accordance with work instructions.
	2.6	Completed communication frames/cabinets are checked/tested against work instructions and industry standards and in strict accordance with OHS risk control measures.
	2.7	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.8	Work is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Check quality of assembled telecommunication frames and cabinets	3.1	Established OHS risk control measures for work completion are followed.
	3.2	Quality of assembled frames/cabinets is checked/tested against work instructions and industry standards and in accordance with established routines.
	3.3	Prescribed solutions are used where corrective actions to assembled components are necessary.
	3.4	Work report forms are completed accurately and appropriate person(s) notified in

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ELEMENT	PERFORMANCE CRITERIA
	accordance with established routine.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assembling and connecting telecommunication frames and cabinets.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EF115A Voice and data cabinet assembly, cabling and terminations

Evidence shall show an understanding of voice and data cabinet assembly, cabling and terminations, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Cabinet internal cable routing and management provisions

T2. Cabinet ventilation requirements

T3. Cabinet structure encompassing:

- internal framework
- cable entry
- removable panels
- multiple cabinets
- doors, locks and hinges
- mounting rails
- access to equipment and cabling
- earthing arrangements and methods

T4. Mounting requirements for components that include

- rack units
- patch panels
- routers
- servers

T5. Communication cable and conductor terminations:

- approved termination devices and sockets
- special termination tools and their use
- cable colour coding up to 100 pair indoor and outdoor cable

T6. Methods of terminating cables:

- cables less than twenty pair
- twenty pair cable and greater
- structured cables
- coaxial cables

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REQUIRED SKILLS AND KNOWLEDGE

- optical fibre cables
- termination safety practices

T7. Cable labelling devices

- Quality checks and tests

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to

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be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

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- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble and connect communication frames and cabinets as described in 8) and including:

A	Following assembly instructions
B	Selecting and placing equipment correctly
C	Making connection without damaging switchgear/control
D	Adhering to quality procedures
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling and connecting telecommunication frames and cabinets.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to assembling and connecting telecommunication frames and cabinets each on at least two occasions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Data and Voice Communications

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UEENEEG006A Solve problems in single and three phase low voltage machines

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers ascertaining correct operation of single and three phase machines and solving machine problems as they apply to servicing, fault finding, installation and compliance work functions. It encompasses safe working practices, machine connections circuit arrangements, issues related to machine operation, characteristics and protection and solutions to machine problems derived from calculated and measured parameters.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit

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Prerequisite Unit(s) **2**)

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical licence.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to solve single and three phase low voltage machines problems.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	The nature of the machine (s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve single and three phase low voltage machine problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solve machine problems from measure and calculated values as they apply to single and three-phase low voltage machines.
	2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.7	Problems are solved without damage to machines, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve machine problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in single and three phase low voltage machines.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EG006A Single and three-phase transformers

Evidence shall show an understanding of single and three phase transformers to an extent indicated by the following aspects:

T1 Transformer construction encompassing:

- types of lamination style and core construction used in single-phase, three phase, double wound, auto transformers and instrument transformers.
- identification of different winding styles/types used in transformers.
- methods used to insulate low and high voltage transformers.
- construction of transformer tanks for distribution transformers.
- transformer auxiliary equipment. (Bushings, surge-diverters, tap-changers, hot oil & winding indicators, breather, Buchholz relay and conservator).
- function of transformer auxiliary equipment.
- types of information stated on transformer nameplates.
- application of transformers.
- performing basic insulation resistance, continuity and winding identification tests.

T2 Transformer operation encompassing:

- principles of mutual induction of a transformer.
- factors that determine the induced voltage in a transformer winding.
- determining the value of a transformers secondary voltage and current given one winding's electrical details and turns ratio.
- identification of voltage and current components of a phasor diagram for a transformer on no-load.
- principles of power transferred from the primary to secondary when a load is connected using a phasor diagram neglecting impedance drops.
- selecting transformers for specific application/s.
- safety features specified in AS/NZS3000 with respect to transformers and isolating transformers.

T3 Transformer losses, efficiency and cooling encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- power losses which occur in a transformer.
- tests which allow the power losses of a transformer to be determine.
- determination of transformer losses and efficiency using test results.
- relationship between transformer cooling and rating.
- methods used for natural and forced cooling of transformers.
- properties of transformer oil.
- tests conducted on transformer oil.

T4 Transformer voltage regulation and percent impedance encompassing:

- voltage regulation as applicable to a transformer.
- reasons for voltage variation in the output of a transformer.
- determine the voltage regulation of a transformer from voltage and percentage impedance values.
- percentage impedance as applied to transformers.
- determine the percent impedance by using test results.
- determine percent impedance of a transformer by calculation.

T5 Parallel operation of transformers and transformer auxiliary equipment encompassing:

- determine polarity markings for an unidentified single phase double wound transformer.
- need for parallel operation of transformers.
- conditions/restrictions required before two transformers can be connected in parallel.
- connecting transformers in parallel to supply a single load (loading on transformers operating in parallel).
- the consequences/effect of an incorrect connection.

T6 Auto-transformers and instrument transformers encompassing:

- identification of auto-transformers, voltage transformers and current transformers from their winding diagrams.
- determining voltage and current in the windings of an auto-transformer by calculation.
- advantages and disadvantages of an auto-transformer.
- AS/NZS3000 requirements with respect to transformers.
- construction of voltage transformers.
- ratings of voltage transformers.
- construction of current transformers.
- ratings of current transformers.
- precautionary measures taken to connect and disconnect instrument transformers.
- connection diagrams for instrument transformers.
- applications for auto-transformers and instrument transformers.

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REQUIRED SKILLS AND KNOWLEDGE

KS02-EG006A Alternating current rotating machines

Evidence shall show an understanding of alternating current rotating machines to an extent indicated by the following aspects:

T1 Operating Principles of three phase induction motors encompassing:

- determining circuit operating characteristics by using the right hand (grip) rule for conductors and solenoids and Fleming's left and right hand rules.
- characteristics of the magnetic field produced by a single, two and three-phase windings.
- speed of rotation of a rotating magnetic field.
- relationship between the rotor speed, slip and rotor frequency.
- basic principle of operation of an induction motor.
- reversing the direction of rotation of a three phase induction motor

T2 Three phase induction motor construction encompassing:

- basic component parts of a three-phase induction motor.
- types of rotors used in three-phase induction motors.
- connecting three-phase induction motor in both star and delta.
- dismantling three-phase induction motors.
- testing insulation resistance of a three-phase induction motor prior to connection to the supply.
- testing winding resistance (ohmic value and continuity) of a three-phase induction motor prior to connection to the supply

T3 Three phase induction motor characteristics encompassing:

- relationship between torque, speed, and power and interpretation of speed/torque curves of induction motors.
- squirrel cage motors operating characteristics conditions necessary for an induction motor to produce maximum torque.
- operating characteristics of an induction motor from name plate information and by measurement.
- induction motors efficiency and minimum energy performance standards (MEPS).
- full load efficiency and power factor of induction motors.

T4 Single phase motors – split phase encompassing:

- common types of single phase motor.
- principles of operation of a split phase induction motor.
- construction and basic characteristics of a split phase induction motor.
- applications of split phase induction motors.
- connecting, running and reversing a split phase induction motor.

T5 Single phase motors – capacitor and shaded pole types encompassing:

- identification of single phase induction motors including capacitor start, capacitor

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REQUIRED SKILLS AND KNOWLEDGE

start/capacitor run, permanent split capacitor (PSC) and shaded pole

- principles of operation of each motor type listed above.
- operating characteristics and typical applications of each motor type listed above.
- connection and running each type of motor listed.
- reversing the direction of rotation of each of the capacitor type motors.

T6 Single phase motors – universal encompassing:

- principles of operation of a series universal motor.
- identification and functions of each of the basic parts of a series universal motor.
- operating characteristics and typical uses for a series universal motor.
- connecting, running and reversing a series universal motor.

T7 Motor protection encompassing:

- reasons why motor protection is required.
- requirements of the AS/NZS3000 Wiring rules with regards to motor protection.
- types of motor overload protection.
- operating principles of microtherm devices, thermal and magnetic motor protection devices.
- electrical features of motor protection HRC fuses.
- effects of under voltage and over voltage on motors and motor circuits.
- effects of repetitive starting and/or reversing on motors.
- special requirements for motor protection, in high humidity or moist environments, high temperature areas and corrosive atmospheres.
- operating principles of phase failure protection.
- selecting suitable protective devices for a given motor and starter combination.

T8 Three phase synchronous machines- operation principles and construction encompassing:

- power transfer diagram of an a.c. synchronous machine.
- need for the generation of a sinusoidal waveform.
- principles of operation of a synchronous alternator.
- principles of operation of a synchronous motor.
- principles of operation of an asynchronous generator (induction generator).
- identification of main parts of a synchronous alternator/motor.
- methods used to provide the excitation of a synchronous alternator/motor.
- block diagram of an alternator voltage regulator.
- advantages gained by the parallel operation of alternators.
- starting methods of synchronous motors.

T9 Alternators and generators encompassing:

- effects on the generated voltage of variations in excitation.
- effects on generated voltage of variations in load.
- identification of characteristic curves of an alternator.

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REQUIRED SKILLS AND KNOWLEDGE

- types of prime movers used with single and three phase portable/standby alternators.
- manual operation of single and three phase portable/standby alternators.
- ratings of single and three phase portable/standby alternators.
- applications of single and three phase portable/standby alternators.
- construction details of single and three phase portable/standby alternators.
- common faults found in portable/standby alternators.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on

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EVIDENCE GUIDE

the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in single and three phase low voltage machines as described as described in 8) and including:

    A Determining the operating parameters of existing machines.

    B Altering an existing machine to comply with specified operating parameters.

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EVIDENCE GUIDE

C Developing machines/circuits to comply with a specified function and operating parameters.

D Determining the cause of low efficiency in an existing machine.

E Determining conditions causing an existing circuit to be unsafe.

F Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in single and three phase low voltage machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit

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other units	UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any four of the following problems in single and three-phase low voltage machine and circuits.

- Determining the operating parameters of existing machines
- Altering an existing machine circuit to comply with specified operating parameters
- Developing machine circuits to comply with a specified function and operating parameters

Note:
Operating parameters include voltage, current, torque, efficiency, power, energy and power factor

- Determining the cause of low efficiency in an existing machine.
- Determining problems in existing machines to malfunction

Note:
Problems include bearing noise/faults, vibration, undervoltage, unbalanced windings

- Determining conditions causing an existing machine/circuit to be unsafe.

Note:
Examples of unsafe circuits includes electric shock hazard from indirect contract with conductive parts, insufficiently low impedance of a fault current path and inadequate fault protection

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Electrical

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UEENEEG033A Solve problems in single and three phase low voltage electrical apparatus and circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers ascertaining correct operation of single and three phase low voltage electrical apparatus and circuits and solving circuit problems as they apply to servicing, fault finding, installation and compliance work functions. It encompasses safe working practices, apparatus circuit arrangements, issues related to operation, characteristics and protection and solutions to apparatus/circuit problems derived from calculated and measured parameters.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit

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Prerequisite Unit(s) **2**)

UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical licence.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to solve single and three phase low voltage electrical apparatus/ circuit problems.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	The nature of the apparatus/circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve single and three phase low voltage electrical apparatus/circuit problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus/circuits/plant is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solve apparatus/circuit problems from measure and calculated values as they apply to single and three-phase low voltage apparatus/circuit.
	2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or

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ELEMENT	PERFORMANCE CRITERIA	
		persons and documented.
	2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.7	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve apparatus/circuit problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in single and three phase low voltage electrical apparatus and circuits.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EG033A Electrical apparatus and circuits

Evidence shall show an understanding of electrical apparatus and circuits to an extent indicated by the following aspects:

T1 Lighting circuits – looping at the light/switch encompassing:

- the “loop at the light” method of wiring lighting circuits.
- the “loop at the switch” method of wiring lighting circuits
- wiring diagrams for the lighting circuit of an installation that incorporates one-way, two-way and two-way and intermediate switching of light points using the loop at the light/switch methods of TPS wiring.
- TPS cabling requirement for the loop at the light/switch circuit.
- installation methods of accessories and wiring for a lighting circuit incorporating one-way, two-way and two-way and intermediate switching of lighting points using the loop at the light/switch method of TPS wiring.
- correct operation of the install circuits including testing for correct compliance with Australian Standards.

T2 Circuits for socket outlets encompassing:

- the purpose of socket outlets.
- requirements concerning the polarity of switched socket outlets.
- correct cable size to supply 10 A, 15 A and 20 A socket outlets (single and three phase), for given installation conditions.
- number of socket outlets connected to a 16 A and 20 A circuit breaker.
- installation methods of a single phase socket outlet circuits.
- correct operation of the installed circuits including testing (dead testing only) for correct compliance with Australian Standards.

T3 Final sub-circuits and segregation encompassing:

- purpose of mixed circuits.
- circuit loading for a mixed circuit.
- purpose of segregation of circuits and the AS/NZS3000 requirements.

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REQUIRED SKILLS AND KNOWLEDGE

- Installation methods a single phase mixed circuits.
- correct operation of the installed circuits including testing for correct compliance with Australian Standards.

T4 Electrical heating control devices encompassing:

- methods of manual heat control.
- methods of automatic heat control.
- types and application for common thermostats.
- operation of common thermostats.
- sensitivity and differential of thermostats.
- testing of a thermostat (including differential and correct operation)
- applications of simmerstats (infinite controls).
- operation of a simmerstat.
- electronic heat control (phase control and zero voltage switching).

T5 Fixed electrical heating appliances encompassing:

- Terms: heat energy, temperature, specific heat capacity, thermal conductivity and thermal stability.
- determining the heat energy in joules and kWh in a simple heating process.
- methods of heat transfer.
- Determining the heat energy input and output of a heating process.
- connections to a two phase stove.
- operation of reverse cycle air conditioning.

T6 Electrical water heater operation encompassing:

- types of water heaters (instantaneous and storage) and their methods of control.
- intrinsic safety (pressure relief and thermal cut-out).
- testing of over temperature cut-out point of a thermostat.
- switchboard requirements to supply a controlled load water heater.
- internal circuit of a twin element water heater, and supply connections.
- tariffs employed by local supply authorities.
- solar heating system and its integration into an installation.

T7 Alternative supplies encompassing:

- reasons for the installation of alternative supplies.
- types of alternative supply systems.
- characteristics and operation of UPSs.
- Australian Standards and local requirements for safety services supply systems.

T8 Installation of batteries encompassing:

- common types of primary cells and secondary batteries and typical applications.
- terminal voltage of common primary cells and secondary cells.
- correct storage, handling and disposal techniques for cells and batteries.

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REQUIRED SKILLS AND KNOWLEDGE

- charge/discharge cycle for a secondary cell.
- effect of internal resistance on a secondary cell.
- state of charge of a secondary cell.
- installation of batteries as per AS/NZS3011
- commissioning procedures for various secondary batteries.
- safe working procedures when working with secondary cells and batteries.

T9 Fire protection – residential fire and smoke alarms encompassing:

- types of fire and smoke alarms.
- regulations and standards requirements regarding residential fire and smoke alarms.
- locations for residential fire and smoke alarms.
- wiring methods for residential fire and smoke alarms.
- operation of typical residential fire and smoke alarms

T10 Emergency and evacuation lighting and lighting control encompassing:

- factors and requirements of emergency and evacuation lighting concerning illumination levels, luminaire positioning and operating period.
- characteristics of maintained, non maintained and sustained emergency lighting systems.
- arrangement of batteries in point and central bank emergency lighting supply systems.
- lighting control methods

T11 Lighting concepts and incandescent lighting encompassing:

- basic concepts of lighting.
- terminology, principles and standards relevant to lighting (energy efficiency as per BCA new lamp types and permitted replacements and their efficacy)..
- basic types of luminaries.
- operation of an incandescent lamp.
- types of incandescent lamps.
- expected lamp life, colour rendering and efficacy for typical incandescent lamps.
- lighting layout in terms of visual comfort and relevant Australian standards

T12 Fluorescent low intensity discharge lighting encompassing:

- types of low intensity discharge lamps.
- expected lamp life, colour rendering and efficacy for typical types of low intensity discharge lamps.
- operation of low intensity discharge luminaires including their control equipment.
- Australian Standard and local requirements for low intensity discharge lighting.
- methods for satisfying Australian Standards and local supply authority requirements regarding low intensity discharge lighting.

T13 High intensity discharge lighting encompassing:

- types of high intensity discharge lamps.

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REQUIRED SKILLS AND KNOWLEDGE

- expected lamp life, colour rendering and efficacy for typical types of high intensity discharge lamps.
- operation of high intensity discharge luminaires including their control equipment.
- Australian Standard and local requirements for high intensity discharge lighting.
- methods for satisfying Australian Standards and local supply authority requirements regarding high intensity discharge lighting.
- LED lighting and its applications.
- Neon, Argon and Xenon lighting and their applications.
- comparison of incandescent, low intensity discharge, high intensity discharge, LED and other types of lighting

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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EVIDENCE GUIDE

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in single and three phase low voltage electrical apparatus and circuits as described as described in 8) and including:

A Determining the operating parameters of existing apparatus/circuits.

B Altering an existing apparatus/circuit to comply with specified operating parameters.

C Developing apparatus/circuits to comply with a specified function and operating parameters.

D Determining the cause of low efficiency in an existing apparatus/circuit.

E Determining conditions causing an existing apparatus/circuit to be unsafe.

F Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment	**9.3)** This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include: • OHS policy and work procedures and instructions. • Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit. These should be part of the formal learning/assessment environment. Note: Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy. The resources used for assessment should reflect current industry practices in relation to solving problems in electromagnetic circuits.
Method of assessment	**9.4)** This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5)** There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any four types of problems for both single and three-phase apparatus and circuits and three types of circuit/equipment as listed below.

Type of problems

- Determining the operating parameters of existing apparatus/circuit
- Altering an existing apparatus/circuit to comply with specified operating parameters
- Developing apparatus/circuits to comply with a specified function and operating parameters

Note:
Operating parameters include voltage, current, efficiency, power, energy and power factor

- Determining the cause of low efficiency in an existing apparatus/circuit.
- Determining conditions causing an existing apparatus/circuit to be unsafe.

Note:
Examples of unsafe circuits includes electric shock hazard from indirect contract with conductive parts, insufficiently low impedance of a fault current path and inadequate fault protection

Types of circuits/equipment

- Lighting circuits
- Power circuits
- Rotating machines
- Electrical heating
- Lighting

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

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Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field	**5)**
	Electrical

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UEENEEG063A Arrange circuits, control and protection for general electrical installations

Modification History

Release	Action	Core/Elective	Details	Points
3	Edit		Adjust Performance Criteria numbering that was previously missing	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the arrangement and termination of circuits, control and protection devices and systems for electrical installations operating at voltages up to 1,000 V a.c. or 1,500 V d.c. It encompass knowledge and application of schemes for protection of persons and property, correct functioning, ensuring compatibility with the supply, arranging installation into circuits and selecting and arranging switchgear/controlgear and protective devices to meet compliance requirements and documenting arrangement decisions.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnolgy equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Prerequisite Unit(s) **2)**

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4)**

4.1) General Application

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

4.2) Importation

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to arrange electrical installations circuits, control and protection	1.1	The extent and nature of the electrical installation is determined from job specifications.
	1.2	Safety and other regulatory requirements to which the electrical installation shall comply are identified, obtained and understood.
	1.3	Load requirements for individual current-using equipment is determined from job specifications or from consultation with appropriate persons.
2 Arrange electrical installations circuits, control and protection	2.1	Circuits, control and protective devices are arranged to ensure safe and functional operation of the installation and to comply with technical standards and job specifications and requirements.
	2.2	Earthing is arranged and terminated to comply with the MEN system requirements.
	2.3	Protective devices are selected to meet the required switching and tripping currents, co-ordination and discrimination for overload and short-circuit protection.
	2.4	Residual current devices are selected to meet the required circuit, switching and tripping currents required.
	2.5	Switchgear/control gear is selected to meet current, voltage and IP ratings and functional requirements.
	2.6	Switchboards are arranged to accommodate control and protective devices, links, safety services, and other distributor equipment in accordance with requirements.
3 Document electrical installation circuits, control and protection arrangements	3.1	Evidence is obtained from manufacturers/suppliers that electrical equipment selected complies with safety requirements.
	3.2	Reasons for selections made, including calculations, are documented in accordance with

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ELEMENT	PERFORMANCE CRITERIA	
		established procedures.
	3.3	Electrical installation arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of arranging electrical installations circuits, control and protection.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG063A Electrical installations — arrangement, control and protection

Evidence shall show an understanding of circuit arrangements, control and protection of electrical installations that comply with the Wiring Rules and Service Rules to an extent indicated by the following aspects:

T1 Safety principles to which electrical systems in building and premises shall comply.

- Safety principles are given in Part1 (Section 1) of the Wiring Rules AS/NZS 3000 with deemed-to-comply requirements given in Sections 2 to 8.
- Compliant methods for providing protection - include those for providing protection against direct and indirect contact; thermal effects; unwanted voltages; overcurrent; fault currents; overload; overvoltage; injury from mechanical movement.
- Requirements for installation design and selection of equipment - includes compliant protection arrangements; correct functioning; compatibility with supply; estimation of maximum demands; voltage drop considerations; arrangement of circuits and the like

T2 Circuit and control arrangements encompassing:

- reason for dividing electrical installations into circuits
- factors that shall be considered in determining the number and type of circuits required for an installation.
- daily and seasonal demand for lighting power, heating and other loads in a given installation.
- number and types of circuits required for a particular installation.
- diagrams/schedules of circuits for given installations.
- application and arrangements of SELV and PELV circuits
- application and arrangement of an isolated supply

T3 Hazards and risks in an electrical installation encompassing:

- effects on the human body of various levels of a.c. and d.c. current and duration of current flow for various current paths.

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REQUIRED SKILLS AND KNOWLEDGE

- risk of ignition of flammable materials due the thermal effects of current or electric arcs in normal service of an electrical installation.
- risk of injury from mechanical movement of electrically actuated equipment.
- Protection against direct contact (basic protection)
- acceptable methods
- use of extra-low voltage

T4 Protection against indirect contact encompassing:

- indirect contact with live parts of an electrical installation may occur.
- methods and devices that comply with the Wiring Rules for providing protection against indirect contact.
- components of the 'automatic disconnection of supply' method of protection against indirect contact.
- the terms ‘touch voltage’ and ‘touch current’.
- the current path when a short circuit fault to exposed conductive parts of an appliance occurs.
- protection against indirect contact is by the use of Class II equipment and by electrical separation.
- additional protection by use of Residual Current Devices (RCDs)
- protection against indirect contact by use of extra-low voltage and electrical separation.
- Protection requirements for damp situations.

T5 Earthing encompassing:

- the terms: earthed, earthed situation, earth electrode, equipotential bonding, multiple earthed neutral (MEN) system, protective earth-neutral (PEN) conductor, main earthing conductor, protective earthing (PE) conductor, functional earthing, MEN link.
- selection of minimum size-earthing conductor for a range of active conductor sizes and materials.
- parts of an earthing system and the purpose of each.
- typical arrangement for a MEN earthing system.
- arrangements of protective earthing conductors that comply with the Wiring Rules.
- requirements for equipotential bonding in a range of installation situations.
- Installation of a MEN earthing system for a single phase installation

T6 Protection against overload and short circuit current encompassing:

- overload current or fault currents in an electrical installation.
- equivalent circuit of an earth fault-loop
- level of fault current possible at a given point in an installation from the fault-loop impedance and data from the electricity distributor.
- methods and devices that comply with the Wiring Rules AS/NZS 3000 for providing protection against the damaging effects of overload and fault current

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REQUIRED SKILLS AND KNOWLEDGE

- requirements for co-ordination between protective devices and conductors
- requirements for co-ordination of protection devices for discrimination and back-up protection.

T7 Devices for automatic disconnection of supply encompassing:

- operating principles of thermal/magnet circuit breakers.
- operating principles of common types of fuses.
- operating principles of residual current devices (RCD).
- time/current curves tripping characteristics of various types of circuit breakers that comply with the requirements of the Wiring Rules.
- time/current curves fusing characteristics of various types of fuses that comply with the requirements of the Wiring Rules.
- time/current curves tripping characteristics of various types of RCDs that comply with the requirements of the Wiring Rules.
- factors in a fault loop that will affect the impedance of the circuit.
- maximum impedance of an earth fault-loop to ensure operating of a protection device.
- selecting a fuse for fault current limiting protection.
- drawing switchboard wiring arrangements of 2-pole RCDs, 4-pole RCDs, combination RCD/MCBs.

T8 Protection against over voltage and under voltage encompassing:

- causes of over voltage and how this may affect the electrical system.
- methods for protection against over voltage.
- causes of under voltage and how this may affect the electrical system.
- methods for protection against under voltage.

T9 Control of an electrical installation and circuits encompassing:

- switch types, current and voltage ratings and IP rating and where these apply.
- switching requirements for isolation, emergency, mechanical maintenance and functional control.
- control arrangement for complete installations with and without safety services and an alternative supply.

T10 Switchboards / distribution boards encompassing:

- Purpose, types and applications.
- Physical and circuit arrangements for whole current and CT metering.
- Physical and circuit arrangements of main switches, circuit protection devices, fault-current limiters and metering equipment and other distributor equipment.
- compliance requirements (includes location and access, arc fault protection, identification, construction suitability, equipment marking, wiring, fire protection and arc-fault protection).

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required

9.**2**)

Before the critical aspects of evidence are considered all

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EVIDENCE GUIDE

to demonstrate competency in this unit

prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - arranging electrical installations circuits, control and protection as described as described in 8) and including:

    A Determining the extent and nature of the installation for job specifications

    B Obtaining and understand the safety and other regulatory requirements to which the electrical installation shall comply

    C Determining individual load requirements.

    D Arranging and terminate circuits, control and protective devices to comply with all requirements

    E Selecting circuit protective devices residual current

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device that comply with all requirements.

F Selecting switchgear and control gear that meet current, voltage and IP ratings and functional requirements.

G Obtaining evidence of compliance for the equipment selected

H Documenting installation arrangement, specification for items selected and reasons for the selections made.

I Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to arranging circuits, control and protection for general electrical installations.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to arranging of circuits, control and protection for at least two general electrical installations comprising a main switchboard, supplying more than one circuit each for, lighting, socket outlets, and fixed appliances. One of the installations shall include a distribution board separate from the main switchboard and at least one circuit supplying a three-phase load and a fire pump.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Electrical

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UEENEEG076A Install and replace low voltage current transformer metering

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the installation and/or replacement of low voltage CT metering for measurement of energy use by consumers under choice of supplier arrangement. It encompasses working safely and to installation and set up standards, evaluating the integrity of metering wiring and earthing systems, fixing metering, making power and communication connections, setting meter parameters and completing the necessary documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work.

Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable, contracts of training such as apprenticeships.

Note.
Competency requirements to be granted a license to carry out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Note: Those holding an 'Unrestricted Electrician's Licence' or equivalent issued in an Australian State or Territory meet the pre-requisite requirements of this unit.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits

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Prerequisite Unit(s) **2)**

UEENEEE105 A	Fix and secure electrotechnology equipment
UEENEEE107 A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137 A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006 A	Solve problems in single and three phase low voltage machines
UEENEEG033 A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063 A	Arrange circuits, control and protection for general electrical installations
UEENEEG101 A	Solve problems in electromagnetic devices and related circuits
UEENEEG102 A	Solve problems in low voltage a.c. circuit
UEENEEG103 A	Install low voltage wiring and accessories
UEENEEG104 A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG106 A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107 A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108 A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109 A	Develop and connect electrical control circuits
UEENEEG105 A	Verify compliance and functionality of low voltage general electrical installations

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install or replace CT energy metering.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented. (Note 1: Examples of hazards likely to be encountered are asbestos reinforced switchboard panels, deteriorating switchgear and cabling and location of the switchboard.)
	1.4	Switchboard on which the meter(s)/CTs is/are to be installed is inspected and evaluated for compliance with safety and functionality standards. (Note 2: Safety and

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ELEMENT	PERFORMANCE CRITERIA	
		functionality standards include the clear identification of switchboard components and their function, sound electrical insulation of wiring and components, sound MEN and main earth connections, fire integrity and access.)
	1.5	Approval to rectify safety and/or functionality defects of the switchboard is sought from person of higher authority in accordance with established procedures.
	1.6	Installation of the meter and rectification work is prepared in consultation with others affected by the work and sequenced appropriately.
	1.7	Material needed for the work is obtained in accordance with established procedures and checked against job requirements.
	1.8	Tools, equipment and testing devices needed to for the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Install or replace CT metering.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Existing metering is checked as being isolated in strict accordance OHS requirements and procedures.
	2.4	Approved rectification work is carried out to comply with standards and in accordance with established procedures.
	2.5	Meters and CTs are installed/replaced to comply with technical standards and job specifications and requirements.
	2.6	Metering power and communication connections (where necessary) are made in accordance with manufacturer's specifications and functional and regulatory requirements.
	2.7	Meter operating parameters are set in accordance with manufacturer's specifications and functional and

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ELEMENT	PERFORMANCE CRITERIA	
		regulatory requirements.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person
	2.9	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures.
	2.10	Metering/CT installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
3 Complete and report metering installation activities.	3.1	OHS work completion risk control measures and procedures are followed and supply is reinstated to the installation.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to that the installed metering and CTs conform to requirements.
	3.4	'As-installed' metering and CTs and rectification work is documented and appropriate persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and setting up interval metering.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG076A Low voltage current transformer metering

Evidence shall show an understanding of low voltage current transformer metering to an extent indicated by the following aspects:

T1 Current Transformers (CTs) encompassing:

- uses and functions
- AS60044.1-2007 requirements
- characteristics and saturation
- differences between metering and protection CTs
- standard ratios and outputs
- accurate range of loading
- thermal current limit
- burden and connecting cable length
- short circuiting secondary as a safety issue
- accuracy class

T2 Revenue meter types used with CTs encompassing:

T3 CT installations encompassing:

- uses in the regulated market and relevant regulations
- types and mounting methods
- switchboard layouts (various Distributors)
- minimum spacing of CTs
- connections to single and polyphase revenue meters
- consequence of polarity reversal in one phase of a polyphase meter

Evidence Guide

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competenc

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines

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y in this unit

- UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install /replace low voltage CT metering as described in 8) and including:

    A Inspecting and evaluating safety and functionality compliance of the switchboard accurately.

    B Following established procedures to obtain approval to rectify non-compliance aspects of the switchboard.

    C Carrying out preparation work effectively.

    D Rectifying compliance defects.

    E Placing and securing metering correctly.

    F Making power and communications connections in accordance with manufacture's specifications and functional and regulatory requirements.

    G Setting meter parameters in accordance with manufacture's specifications and functional and regulatory requirements.

    H Reinstating supply to the installation safely.

    I Documenting CT metering and rectification work and notifying appropriate persons in accordance with

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established procedures.

J Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and setting up interval metering.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

There are no concurrent assessment recommendations for this unit.

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other units

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to the installation of at least a:

- low voltage CT installation using single phase meters
- low voltage CT installation using a polyphase meter
- metering installation where compliance rectification work is required

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Electrical

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UEENEEG101A Solve problems in electromagnetic devices and related circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers determining correct operation of electromagnetic devices and related circuits and providing solutions as they apply to electrical installations and equipment. It encompasses working safely, power circuit problems solving processes, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in electromagnetic devices and related circuits.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s)

2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical licence.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on electromagnetic devices and circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the device(s)/circuit(s) problem is obtained from documentation or from work supervisor

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ELEMENT	PERFORMANCE CRITERIA	
		to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve electromagnetic devices/circuit problems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solving circuit problems from measure and calculated values as they apply to electromagnetic devices/circuits.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in electromagnetic devices and related circuits.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EG101A Electromagnetic devices and circuits

Evidence shall show an understanding of electromagnetic devices and circuits to an extent indicated by the following aspects:

T1 Magnetism encompassing:

- magnetic field pattern of bar and horse-shoe magnets.
- magnets attraction and repulsion when brought in contact with each other.
- common magnetic and non-magnetic materials and groupings (diamagnetic, paramagnetic and ferromagnetic materials).
- principle of magnetic screening (shielding) and its applications.
- practical applications of magnets
- construction, operation and applications of reed switches.

T2 Electromagnetism encompassing:

- conventions representing direction of current flow in a conductor.
- magnetic field pattern around a single conductor and two adjacent conductors carrying current.
- Using the “right hand rule” to determine the direction of magnetic field around a current carrying conductor.
- direction of force between adjacent current carrying conductors.
- effect of current, length and distance apart on the force between conductors (including forces on bus bars during fault conditions).
- magnetic field around an electromagnet.
- Using the “right hand rule” to determine the direction of magnetic field around a current carrying coil.
- magnetomotive force (m.m.f.) and its relationship to the number of turns in a coil and the current flowing in the coil.
- practical applications of electromagnets.

T3 Magnetic circuits encompassing:

- magnetic characteristic curve for various materials and identify the various regions.
- Identify the various conditions of a magnetic material from its Hysteresis loop.

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REQUIRED SKILLS AND KNOWLEDGE

- factors which determine losses in magnetic material.
- methods used to reduce electrical losses in a magnetic circuit.
- magnetic flux (definition, unit and symbol).
- reluctance as the opposition to the establishment of magnetic flux.
- permeability (definition, symbol and unit).
- difference for magnetic and non-magnetic materials in regards to reluctance and permeability.
- calculation of m.m.f., flux or reluctance given any two values.
- flux density (definition, symbol, unit and calculation).
- magnetising force (definition, symbol, unit and calculation).
- common magnetic circuit types.
- effect of an air gap in a magnetic circuit.
- terms “magnetic leakage” and “magnetic fringing”.

T4 Electromagnetic induction encompassing:

- principle of electromagnetic induction (Faraday’s law of electromagnetic induction).
- applying “Fleming’s right hand rule” to a current a carrying conductor under the influence of a magnetic field.
- calculation of induced e.m.f. in a conductor given the conductor length, flux density and velocity of the conductor.
- calculation of induced e.m.f. in a coil given the number of turns in a coil and the rate of change of flux.
- calculation of force on a conductor given the flux density of the magnetic field, length of the conductor and the current being carried by the conductor.
- Lenz’s law
- applications of electromagnetic induction

T5 Inductance encompassing:

- construction of an inductor, including a bifilar winding inductor.
- Australian Standard circuit diagram symbol for the four types of inductor.
- effect of physical parameters on the inductance of an inductor.
- common types of inductor cores.
- applications of the different types of inductors.
- definition of terms self induction, inductance and mutual inductance.
- calculation of value of self induced e.m.f. in a coil.
- mutual induction occurs between two coils.
- graphical relationship between load voltage, current and self induced e.m.f. in a single d.c. circuit having inductance.
- practical applications for the effects of self and mutual induction.
- undesirable effects of self and mutual induction.
- definition of term “time constant” and draw the characteristic curve as applied to a series circuit containing an inductor and a resistor. (LR circuit)Calculation of value

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REQUIRED SKILLS AND KNOWLEDGE

of the time constant for an LR circuit given the values of the components.

- time constants required for the current in an LR circuit to reach its final value.
- determining of instantaneous values of voltage and current in an LR circuit using a universal time constant chart.

T6 Measurement Instruments encompassing:

- moving coil, moving iron, dynamometer meter movements and clamp testers.
- practical applications for moving coil, moving iron and dynamometer meter movements.
- Calculation of resistance of shunts and multipliers to extend the range of ammeters and voltmeters.
- factors to be considered in selecting meters for a particular application.
- safety category of meters and their associated applications.
- steps and procedures for the safe use, care and storage of electrical instruments.

T7 Magnetic devices encompassing:

- construction, operation and applications of relays.
- construction, operation and applications of contactors.
- magnetic methods used to extinguish the arc between opening contacts.
- construction, operation and applications of Hall Effect devices.
- operation and applications of magnetostriction equipment.
- construction, operation and application of magnetic sensing devices.

T8 Machine principles encompassing:

- basic operating principle of a generator.
- applying Fleming's right hand rule for generators.
- basic operating principle of a motor.
- applying Fleming's left hand rule for motors.
- calculation of force and torque developed by a motor.

T9 Rotating machine construction, testing and maintenance encompassing:

- components of a d.c. machine.
- difference between a generator and a motor in terms of energy conversion.
- nameplate of a machine.
- using electrical equipment to make electrical measurements and comparison of readings with nameplate ratings.
- Identification of faults in a machine from electrical measurements.
- care and maintenance processes for rotating machines
- safety risks associated with using rotating machinery.

T10 Generators encompassing:

- basic operation of a d.c generator.
- calculation of generated and terminal voltage of a d.c. shunt generator

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REQUIRED SKILLS AND KNOWLEDGE

- prime movers, energy sources and energy flow used to generate electricity.
- types of d.c. generators and their applications.
- methods of excitation used for d.c generators.
- equivalent circuit for a d.c. generator.
- importance of residual magnetism for a self excited generator.
- open circuit characteristics of d.c. generators.
- load characteristics of a d.c generator.
- reversing the polarity of a d.c. generator
- Connect and test a d.c generator on no-load and load
- Identify safety risks associated with using generators.

T11 Motors encompassing:

- operation of a motor and its energy flow.
- effect of back e.m.f. in d.c. motors
- torque as the product of the force on the conductors and the radius of the armature/rotor.
- types of d.c. motors and their applications.
- circuit diagrams for the types of d.c. motors.
- equivalent circuit for the types of d.c. motors.
- calculation of power output of a motor.
- characteristics of the different types of d.c. motors.
- connection and testing a d.c. shunt motor on no-load and load
- reversing the direction of rotation of a d.c. motor.
- safety risks associated with using motors (include risks of series d.c. motors).

T12 Machine efficiency encompassing:

- losses that occur in a d.c machine.
- methods used to determine the losses in a d.c. machine.
- calculation of losses and efficiency of a d.c machine.
- efficiency characteristic of a d.c. machine and the conditions for maximum efficiency.
- application of Minimum Energy Performance standards (MEPS).
- methods used to maintain high efficiency.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

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EVIDENCE GUIDE

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also

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EVIDENCE GUIDE

comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in electromagnetic circuits as described as described in 8) and including:

    A Using methodological techniques to solve problems in circuits with an electromagnetic device from measure and calculated values

    B Determining the operating parameters of an existing circuit with an electromagnetic device.

    C Alternating an existing circuit with an electromagnetic device to comply with specified operating parameters.

    D Developing circuits with electromagnetic devices to comply with a specified function and operating parameters.

    E Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in electromagnetic devices and related circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solving problems in electromagnetic devices and related circuits by:

- Determining the operating parameters of an existing circuits with electromagnetic devices
- Altering an existing circuit with an electromagnetic device to comply with specified operating parameters
- Developing circuit with an electromagnetic device to comply with a specified function and operating parameters

AND

In relation to the following on more than one occasions:

Solving problems

- Connecting circuits,
- Using methodological problem solving techniques,
- Solving electromagnetic device problems,
- Demonstrate an understanding of the behaviour of current and voltage in circuits with electromagnetic devices
- Calculating circuit parameters accurately,

Circuit and device testing

- Choose correct instruments and ranges for testing,
- Connect meters to measure parameters in circuits with electromagnetic devices,

and

At least four of the following electromagnetic devices

- Reed switches
- Solenoids
- Relays
- Contactors
- Inductive limit switches
- Bells

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RANGE STATEMENT

- Lifting magnets
- Core balance devices
- Magnetic overloads
- Motors
- Generators
- Magnetic brakes
- Magnetic circuit breakers

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5)**

Electrical

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UEENEEG102A Solve problems in low voltage a.c. circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers ascertaining correct operation of single and three phase a.c. circuits and solving circuit problems as they apply to servicing, fault finding, installation and compliance work functions. It encompasses safe working practices, multiphase circuit arrangements, issues related to protection, power factor and MEN systems and solutions to circuit problems derived from calculated and measured parameters.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical licence.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to solve low voltage a.c. circuit problems.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control

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ELEMENT		PERFORMANCE CRITERIA	
			measures are implemented.
		1.4	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.6	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve low voltage a.c. circuit problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
\		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Established methods are used to solve circuit problems from measure and calculated values as they apply to single and three-phase low voltage circuit.
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and Solving single and three phase low voltage circuit problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG102A Alternating current power circuits

Evidence shall show an understanding of alternating currents power circuits to an extent indicated by the following aspects:

T1 Alternating Current Quantities encompassing:

- sine, cosine and tangent ratios of a right angle triangle
- Pythagoras Theorem to a right angle triangle.
- use of the CRO to measure d.c. and a.c. voltage levels
- sinusoidal voltage generated by a single turn coil rotated in a uniform magnetic fields
- terms 'period', 'maximum value', 'peak-to-peak value', 'instantaneous value', 'average value', 'root-mean-square (r.m.s.) value', in relation to a sinusoidal waveform.
- calculation of the instantaneous value of induced voltage of a generated sinusoidal waveform.
- measurement of instantaneous, peak, peak-to-peak values and the period of a sinusoidal waveform.
- calculation of root-mean-square (r.m.s.) value and frequency of a sinusoidal waveform from values of peak voltage and period.

T2 Phasors Diagrams encompassing:

- purpose of phasor diagrams
- 'in-phase', 'out-of-phase', 'phase angle" lead' and 'lag'.
- phase angle between two or more alternating quantities from a given sinusoidal waveform diagram.
- convention for representing voltage, current and the reference quantity in a phasor diagram.
- drawing phasor diagrams to show the relationship between two or more a.c. values of voltage and/or current.
- determination of phase relationship between two or more sinusoidal waveforms from a given diagram and measurements.

T3 Single Element a.c. circuits encompassing:

- setting up and connect a single-source resistive a.c. circuit and take voltage and current

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REQUIRED SKILLS AND KNOWLEDGE

measurements to determine the resistance

- determining the voltage, current resistances from measure of given values of any tow of these qualities.
- relationship between voltage drops and current in resistive a.c. circuit
- applications of resistive a.c. circuits
- defining ‘inductive reactance’.
- calculation of inductive reactance for a given inductor and the relationship between inductive reactance and frequency.
- applying Ohm’s Law to determine voltage, current of inductive reactance in a purely inductive a.c. circuit given any two to these quantities.
- applications of inductive a.c circuits.
- calculation of capacitive reactance
- applying Ohm’s Law to determine voltage, current or capacitive reactance in a purely capacitive a.c circuit given any two of the quantities.
- applications of capacitive a.c circuits

T4 RC and RL Series a.c. circuits encompassing:

- impedance and impedance triangle.
- determining the impedance, current and voltages for a series RC circuit given the resistance, capacitance and supply voltage.
- drawing and labelling the impedance triangle for a series RC circuit
- drawing phasor diagrams for a series RC circuit
- AS/NZS 3000 requirements for the installation of capacitors.
- examples of capacitive components in power circuits and systems and the effect on the phase relationship between voltage and current.
- determining the impedance, current and voltages for a series RL circuit given the resistance, inductance and supply voltage.
- drawing and labelling the impedance triangle for a series RL circuit
- drawing the equivalent circuit of a practical inductor
- Draw phasor diagrams for a series RL circuit.
- examples of inductive components in power circuits and systems and describe their effect on the phase relationship between voltage and current

T5 RLC Series a.c. circuits encompassing:

- measuring component voltages in a series RLC circuit and using a phasor diagram to determine the supply voltage and phase angle between circuit voltage and circuit current.
- determining the impedance, current and voltages for a series RLC circuit given resistance, inductance, capacitance and supply voltage.
- drawing and labelling the impedance triangle for a series RLC circuit.
- calculation of total impedance for a series RLC circuit.
- calculation of voltage drop for cables using the values for reactance and a.c. resistance from AS/NZS 3008.

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REQUIRED SKILLS AND KNOWLEDGE

- comparison of current limiting characteristics of inductors and resistors.
- practical examples of RLC series circuits

T6 Parallel a.c. Circuits encompassing:

- determining the branch currents of a parallel circuit that contain RL, RC or LC in two branches.
- using a phasor diagram to determine the total circuit current and phase angle in parallel RL, RC or LC circuits.
- determining the total circuit impedance of parallel RL, RC or LC circuits.
- measuring the branch currents in a parallel RLC circuit and use a phasor diagram to determine the total current and phase angle between circuit voltage and circuit current.
- determining the branch impedances, branch currents and phase angles voltages for a parallel RLC circuit given resistance, inductance, capacitance and supply voltage.
- calculation of impedance for a parallel RLC circuit.
- practical examples of parallel circuits.

T7 Power in an a.c. circuit encompassing:

- difference between true power, apparent power and reactive power and the units in which these quantities are measured.
- drawing the power triangle to show the relationships between true power, apparent power and reactive power
- defining the term "power factor" and phase angle.
- methods used to measure single phase power, energy and demand.

T8 Power Factor Improvement encompassing:

- effects of low power factor.
- requirements for power factor improvement.
- methods used to improve low power factor of an installation.
- local supply authority and AS/NZS 3000 wiring rules requirements regarding the power factor of an installation and power factor improvement equipment.
- methods used to measure single phase power factor.
- using manufacturers catalogues to select power factor equipment for a particular installation

T9 Harmonics and Resonance Effect in a.c. Systems encompassing:

- term "harmonic" in relation to the sinusoidal waveform of an a.c. power system.
- sources in a.c. systems that produce harmonics.
- problems that may arise in a.c. circuits as a result of harmonics and how these are overcome.
- methods and test equipment used to test for harmonics
- methods used to reduce harmonics in a.c. power system
- conditions in a series a.c. circuit that produce resonance.
- dangers of series resonance circuits

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REQUIRED SKILLS AND KNOWLEDGE

- conditions in a parallel a.c. circuit that produce resonance.
- dangers of parallel resonance circuits
- AS/NZS3000 and the local supply authority requirements concerning harmonics and resonance effect in a.c. power systems.

T10 Three Phase Systems encompassing:

- features of a multiphase system.
- comparison of voltages generated by single and multiphase alternators.
- reasons for the adoption of three phases for power systems.
- how three phases is generated in a single alternator.
- Calculation of r.m.s. value of voltage generated in each phase given the maximum value.
- relationship between the phase voltages generated in a three phase alternator and the conventions for identifying each.
- term "phase sequence" (also, referred to as "phase rotation").
- determining the phase sequence of a three phase supply

T11 Three phase star-connections encompassing:

- connecting a three phase star-connection load.
- phase relationship between line and phase voltages and line and phase currents of a star-connected system.
- determining the r.m.s. value of line and phase voltage given any one of these quantities.
- determining the r.m.s. value of line and phase current given any one of these quantities.
- terms "balanced load" and "unbalanced load".
- effect of a reversed phase winding of a star connected alternator.
- example of balanced and unbalanced loads in typical power systems.

T12 Three phase four wire systems encompassing:

- purpose of the neutral conductor in a three phase four wire systems.
- determining the effects of an high impedance in the neutral conductor of a three phase four wire system supplying an unbalanced load where MEN earthing is employed.
- determining the value and phase relationship of neutral current in an unbalanced three phase four wire systems given line currents and power factors.
- AS/NZS 3000 requirements regarding neutral conductors.
- AS/NZS 3008.1.1 method for determining voltage drop in unbalanced three phase circuits

T13 Three phase delta-connections and Interconnected systems encompassing:

- connecting three phase delta loads.
- phase relationship between line and phase voltages and line and phase currents of a delta-connected system.
- determining the r.m.s. value of line and phase voltage given any one of these quantities.
- determining the r.m.s. value of line and phase current given any one of these quantities.

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REQUIRED SKILLS AND KNOWLEDGE

- limitations and uses of open delta connections
- effect of a reversed phase winding of a delta connected transformer
- example of loads in typical power systems.
- drawing the typical combinations of three phase interconnected systems using star-connections and a delta-connection.
- relationship between line and phase voltages and line and phase currents in the typical interconnected systems using star-connections and delta-connections.

T14 Energy and power requirements of a.c. systems encompassing:

- purposes for measuring power, energy, power factor and maximum demand of a.c. power systems and loads.
- difference between true power, apparent power and reactive power and the units in which these quantities are measured in a three phase system.
- drawing the power triangle to show the relationships between true power, apparent power and reactive power in a three phase system.
- methods used to measure three phase power , energy, power factor and demand.
- determining how the power factor of a three phase installation can be improved.
- using manufacturers catalogues to select measurement equipment for a particular installation

T15 Fault Loop Impedance encompassing:

- term fault loop impedance of a a.c. power system
- determining fault loop impedance using resistance and reactance values from AS/NZS 3008.1.1
- measuring fault loop impedance of typical circuits
- procedures for testing fault loop impedance

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

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EVIDENCE GUIDE

can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in single and three phase circuits as described as described in 8) and including:

    A Using methodological techniques to solve problems in circuits in a.c. circuits from measure and calculated values

    B Determining the operating parameters of existing circuits

    C Altering an existing circuit to comply with specified operating parameters.

    D Developing circuits to comply with a specified function and operating parameters.

    E Determining the cause of low power factor in an existing circuit.

    F Determining conditions causing an existing circuit to be unsafe.

    G Dealing with unplanned events

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving single and three phase low voltage circuit problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solving problems in a.c. circuit by:

- Determining the operating parameters of existing circuits
- Altering an existing circuit to comply with specified operating parameters
- Developing circuits to comply with a specified function and operating parameters of voltage, current, impedance, power and power factor
- Determining the cause of low power factor in an existing circuit.
- Determining conditions causing an existing circuit to be unsafe includes electric shock hazard from indirect contract with conductive parts, insufficiently low impedance of a fault current path and inadequate fault protection.

In relation to the following on more than one occasions:

Single phase circuits

- Connecting single-phase circuits
- Choosing correct instruments
- Taking measurements correctly and accurately.

Three-phase circuits

- Connecting three-phase circuits
- Choosing correct instruments
- Taking measurements correctly and accurately.

AND

At least four of the following applications

- Series a.c. circuits
- Parallel a.c. circuits
- Series / parallel a.c. circuits
- Single phase motors / controls
- Three phase motors / controls
- Synchronous machines
- Transformers / Auxiliary components

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RANGE STATEMENT

- Star connected circuits
- Delta connected circuits
- Star-Delta interconnected circuits
- Open Delta circuits

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5)**

Electrical

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UEENEEG103A Install low voltage wiring and accessories

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the installation in building and premises of wiring enclosures, cable support systems, cables and accessories and designed to operate at voltages up to 1,000 V a.c. or 1,500 V d.c. It encompasses working safely and to installation standards, routing cables to specified locations, terminating cables and connecting wiring at accessories and completing the necessary installation documentation.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licensing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG00	Solve problems in single and three phase

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Prerequisite Unit(s) **2)**

6A	low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**

4.1) General Application

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical license.

4.2) Importation

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RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install wiring and accessories.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Installation of wiring is prepared in consultation with other affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or other appropriate person to establish the scope of work to be undertaken.
	1.6	Cable routes are planned within the constraints of the building structure, significants and requirements.
	1.7	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
	1.8	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct

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ELEMENT	PERFORMANCE CRITERIA	
		operation and safety.
	1.9	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2 Install wiring and accessories.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Wiring and accessories are installed to comply with technical standards and job specifications and requirements with sufficient excess to affect terminations.
	2.5	Accessories are installed straight and square in the required locations and within acceptable tolerances.
	2.6	Cables and conductors are terminated at accessories in accordance with manufacture's specifications and regulatory requirements.
	2.7	Ongoing compliance and safety inspection of installed wiring systems and testing of installed circuits is undertaken.
	2.8	Defects revealed through on-going compliance and safety inspection and tests are rectified.
	2.9	Cable installation and termination is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
3 Completion and report installation activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance

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ELEMENT	PERFORMANCE CRITERIA	
		with established procedures.
	3.3	'As-installed' cables/wiring and accessories is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing wiring and accessories for low voltage circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry standards, technologies and practices.

KS01-EG103A Installation of wiring systems

Evidence shall show an understanding of the installation of wiring systems that comply with standards to an extent indicated by the following aspects:

T1 Standards, codes and requirements applicable to the installation of wiring systems encompassing:

- Cables and methods of mechanical protection and support
- Protection against and from other services.
- Prohibited cable locations
- Building codes affecting the installation of cables in buildings, structures and premises (limitation on penetration of structural elements, maintenance of fire protection integrity, and wiring above suspected ceilings)
- Issues affecting electrical installations in heritage buildings and premises (limitation on penetration of structural and finished elements, accessing cable routes, types and colour of exposed accessories).

T2 Use of other installation standards called up by the Wiring Rules for special situations encompassing:

- standards that apply to Electromedical treatment areas.
- additional requirements for construction and demolition sites.
- Relocatable installations and their site supply
- additional requirements for caravan park.
- additional requirements for marinas and pleasure craft at low voltage.
- additional requirements for shows and carnivals.

T3 Hazardous areas encompassing:

- Conditions that apply in an areas that require them to be classified as a ‘Hazardous area’.
- Responsibility for classifying a hazardous area
- Awareness of standards called up by the Wiring Rules for selection of equipment and installations in Hazardous areas. (AS/NZS 3000 requirements for hazardous areas).

T4 Requirement for the installation of cables and accessories in damp situations and

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REQUIRED SKILLS AND KNOWLEDGE

ELV installations encompassing:

- restricted zones around baths, showers, fixed water containers, pools, sauna heaters and fountains/water features for given installations.
- selecting equipment suitable for installation in given damp situations.
- voltage range that defines extra-low voltage.
- 'Separated extra-low voltage (SELV) system' and a 'Protected extra-low voltage (PELV) system".
- AS/NZS 3000 requirements for selecting extra-low voltage systems and devices for a range of installations and conditions.

T5 Aerial cabling encompassing:

- Describe the types of aerial cabling.
- State the AS/NZS 3000 and local supply authority requirements for aerial cabling.
- Termination of aerial cables in accordance with AS/NZS 3000 and local requirements.
- installation of consumers mains for connection via overhead consumers terminals in accordance with AS/NZS 3000 and local requirements.
- Testing of installed cables compliance with Australian Standards

T6 Underground cabling encompassing:

- Describe permissible underground cabling systems.
- Identify other underground services.
- State the AS/NZS 3000 and local supply authority requirements for underground cabling.
- List the advantages and disadvantages of underground wiring systems
- selection of underground consumers mains in accordance with AS/NZS 3000 and local requirements

T7 Techniques for installing cables and wiring systems encompassing:

- Typical cable routes through buildings, structures and premises.
- Application of wiring accessories
- Drawing-in, placing and fixing of cables
- Cable and conductor terminations
- Maintaining fire rating integrity.
- Inspecting and testing installed and terminated cables to ensure they comply with continuity and insulation resistance and are safe to connect to the supply.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with

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EVIDENCE GUIDE

the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall

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be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install wiring and accessories for low voltage circuits as described as described in 8) and including:

    A Reading and interpreting drawings related to cable layouts, cable schedules and apparatus locations.

    B Planning cable routes and obtaining installation materials.

    C Sequencing the installation effectively with other affected by the work.

    D Routing, placing and securing cables in compliance with requirements.

    E Placing and securing accessories accurately.

    F Maintaining fire integrity.

    G Terminating cable and conductors to comply with requirements.

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H Undertaking on-going compliance and safety inspection and testing of installed circuits.

I Rectifying any defects revealed through on-going inspection and testing

J Correctly documenting 'as-installed' cables/wiring and accessories.

K Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing wiring and accessories for low voltage circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and

9.5)

For optimisation of training and assessment effort, competency

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relationship with other units	development in this unit may be arranged concurrently with unit:	
	UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to at least three different types of cable enclosure/support systems in combination with four different cable types and circuits for five different purposes as listed below.

Wiring systems enclosures and supports:

- Metallic conduit
- Non-metallic conduit
- Trunking
- Duct
- Cable tray/ladder
- Catenary
- Posts/poles/struts

Cable types:

- Thermoplastic insulated cable (TPI)
- Flat thermoplastic sheathed (TPS)
- Circular thermoplastic sheathed (TPS)
- Steel wire armoured (SWA)
- Fire rated cable (HT or HF or MIMS)
- Flexible cables
- Aerial cable

Circuit purpose:

- Consumers mains
- Submains
- Alternative supply
- Lighting;
- Socket outlets
- Single phase fixed appliance
- Single phase motor
- Three phase motor
- Control

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RANGE STATEMENT

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5)**

Electrical

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UEENEEG104A Install appliances, switchgear and associated accessories for low voltage electrical installations

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the installation of appliances protection devices, switchgear, controlgear, switchboards, and accessories designed to operate at voltages up to 1,000 V a.c. or 1,500 V d.c. It encompasses working safely and to installation standards, matching appliances and accessories with that specified, making required circuit connections and completing the necessary installation documentation.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licensing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Prerequisite Unit(s) **2)**

UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical license.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install appliances, switchgear and associated accessories.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
		1.4	Installation is prepared in consultation with others affected by the work and sequenced appropriately.
		1.5	The nature and location of the work is determined from documentation or appropriate person to establish the scope of work to be undertaken.
		1.6	Locations of appliances, switchgear and accessories is planned within the constraints of the building structure, significants and requirements.
		1.7	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
		1.8	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.9	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2	Install appliances, switchgear and associated accessories.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Appliances, switchgear and accessories are installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance.
		2.5	Accessories are installed straight and square in the required locations and within acceptable tolerances.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Wiring is terminated at appliances, switchgear and accessories in accordance with manufacture's specifications and functional and regulatory requirements.
	2.7	Ongoing compliance and safety inspections of the installed appliances, switchgear and accessories is undertaken.
	2.8	Defects revealed through on-going compliance and safety inspection are rectified.
	2.9	Installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
3 Completion and report installation activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.4	'As-installed' appliances, switchgear and accessories is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing low voltage electrical appliance, switchgear and accessories.

All knowledge and skills detailed in this unit should be contextualised to current industry standards, technologies and practices

KS01-EG104A Installation of appliances, switchgear and accessories

Evidence shall show an understanding of the installation of appliances (current-using equipment) and accessories to an extent indicated by the following aspects:

T1 Installation standards, codes and requirements applicable to installing electrical equipment encompassing.

- Protection against thermal effects
- Connection of electrical equipment (appliances, switchgear and accessories include switchgear and controlgear, switchboards, socket-outlets, lighting equipment and accessories, lamps and luminaires, smoke and fire detectors, cooking appliances, appliances producing hot water or steam, room heaters, electric heating cables for floors and ceilings, space heating, duct heaters, electricity converters, motors, transformers, capacitors, and batteries).
- Required and permitted locations current-using equipment and accessories
- Control, switching and over current and RCD protection

T2 Terminal configuration for connection of phase, neutral and protective earthing conductors for each type of equipment.

T3 Building codes affecting the installation of current-using equipment and accessories in buildings, structures and premises encompassing:

- maintenance of fire protection integrity, requirements for emergency services (safety services) and the like.

T4 Issues affecting electrical installations in heritage buildings and premises encompassing:

- limitation on types and colour of exposed accessories.

Evidence Guide

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required

9.**2**)

Before the critical aspects of evidence are considered all

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EVIDENCE GUIDE

to demonstrate competency in this unit

prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install low voltage electrical apparatus and associated equipment as described as described in 8) and including:

    A Reading and interpreting drawings related to and apparatus locations and circuit connections.

    B Planning installation of appliances, switchgear and accessories and obtaining installation materials.

    C Sequencing the installation effectively with other affected by the work.

    D Placing and securing appliances, switchgear and accessories accurately in their planned location and in compliance with standards.

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EVIDENCE GUIDE

E Maintaining fire integrity.

F Terminating and connecting appliances, switchgear and accessories to comply with requirements.

G Undertaking on-going compliance and safety inspections

H Rectifying any defects revealed through on-going inspections

H Correctly documenting 'as-installed' appliances, switchgear and accessories.

I Dealing with unplanned events

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing low voltage electrical apparatus and associated equipment.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG103A Install low voltage wiring and accessories

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installation and connection of appliances, switchgear and associated accessories as follows:

Each of the following

- Installing and connecting main switches, protective devices and links on a main switchboard and preparing the switchboard for the installation of metering
- Installing and connecting a custom switchboard;
- Socket-outlets;
- Lighting equipment and accessories;
- Luminaires, and

At least four of the following

- Cooking appliances
- Smoke and fire detectors
- Water heaters and controls
- Three phase motor starter and control switches
- Fixed electric heating system (room heaters)
- Transformers
- Appliances producing hot water or steam
- Electric heating cables for floors and ceilings
- Trace heating
- Duct heaters
- Electricity converters
- Capacitors.
- Batteries.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5)**

Electrical

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UEENEEG105A Verify compliance and functionality of low voltage general electrical installations

Modification History

Release	Action	Core/Elective	Details	Points
3	Edit	N/A	Corrected text in Range Statement	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers inspection and testing to verify whether an electrical installation is safe and complies with all requirements. It encompasses working safely, visual inspections and mandatory, optional and functional testing following verification procedures, identifying non-compliance defects and mandatory reporting requirements.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines

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Prerequisite Unit(s) **2)**

UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

2.2) Conditions

- Those holding an 'Unrestricted Electrician's Licence' or equivalent issued in an Australian State or Territory meet the requirements of this unit and its pre-requisite requirements.
- A 'licensed electrician' applying for an 'electrical contractors licence' may be required to undertake this unit to demonstrate their currency with verification of compliance requirements. In this case they are deemed to have met the pre-requisites for this unit provided that:
  - they hold a current 'electricians licence' or its equivalent issued in an Australian State or Territory and
  - have recently been in permanent employment as a

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licensed electrician sufficient to evidence current knowledge of applicable standards and regulations.

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) General Application

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical licence.

Work which requires an electrical licence includes work on and/or supervision of electrical installations at or above low voltage.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to inspect and test an electrical installation.	1.1	OHS measures for the site are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	Documentation or deemed to comply standard on which installation is based is reviewed and understood.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
	1.7	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2 Visually inspect and conduct safety testing on the installation.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Wiring is checked for suitability for the environments in which they are installed and suitably protected from damage or overheating.
	2.5	Cable conductor sizes are confirmed as meeting current-carrying capacity requirements and voltage-drop and fault-loop impedance limitations.
	2.6	Protection methods and devices are validated as meeting co-ordination requirements for overload and short-circuit protection.
	2.7	Switchgear and control gear is validated as being appropriately rated and meeting functional requirements.

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ELEMENT	PERFORMANCE CRITERIA	
	2.8	Evidence that electrical equipment complies with safety requirements is cited.
	2.9	Earthing system components are checked that they are correctly located and conductors correctly sized.
	2.10	Marking on switchboards are checked for accuracy and clarity and comply with requirements.
	2.11	Mandatory tests are conducted to verify that: earthing conductor resistance is sufficiently low; insulation resistance is sufficiently high; all polarities are correct; and circuit connections are correct as per AS/NZS3000.
	2.12	Testing is conducted to verify that: fault-loop impedance is sufficiently low and residual current devices operates as intended as per AS/NZS3000.
3 Report inspection and test findings.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Non-compliance defects are identified and reported in accordance with established procedures.
	3.4	Recommendations for rectifying defects are made in accordance with established procedures.
	3.5	Mandatory documentation is completed in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and verifying compliance and functionality of general electrical installations.

All knowledge and skills detailed in this unit should be contextualised to current industry standards, technologies and practices.

KS01-EG105A Electrical installations — verification and testing

Evidence shall show an understanding of electrical installations testing and verification to an extent indicated by the following aspects:

T1 Electrical safety encompassing:

- Safety procedures for working on electrical systems, circuits and apparatus.
- Safe working practices as a normal part of carrying out electrical installation work
- Isolation and lockout procedures
- Tools and equipment needed to conduct electrical installation compliance inspection and testing.

T2 Legislated regulations encompassing:

- legislation and regulations that require installations and equipment to be inspected and tested to ensure they are safe.
- the person/bodies responsible for the various aspects of ensuring electrical installations are safe.
- results of tests that show an electrical installation is safe for connection to the supply.
- results of periodic inspection and tests that show construction site wiring and equipment is safe to use.
- results of periodic inspection and tests that show electrical equipment are safe to use.

T3 Visual inspection of installations for compliance with the Wiring Rules encompassing:

- Protection requirements
- General condition
- Consumers mains/submains
- Switchboards
- Wiring systems
- Equipment and accessories
- Earthing

T4 Testing installations encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- tests to ensure: insulation resistance is adequate; earth continuity is such that it will ensure the operation of protection devices under earth fault conditions; polarity of active/s and neutral for mains, submains and final subcircuits is correct; there is no transposition of earthing and neutral conductors; fault-loop impedance is sufficiently low; RCD for correct operation and sensitivity.
- functional tests to ensure active/s and neutral for the same circuit are clearly identified with their circuit protection device.
- tests that show all circuits and devices operate as intended.
- tests to determine the fault level at a particular point in an installation.

T5 Documentation encompassing:

- results of tests conducted on an installation to comply with requirements and ensure the installation is safe.
- documents of the results of testing an installation as required by the local supply authority.
- documents of periodic inspection and testing of construction site wiring and equipment in accordance with requirement.
- documents of periodic testing and inspection of electrical equipment including tagging requirements.

KS02-EG105A Electrical installations and equipment — principles and requirements

Evidence shall show an understanding of electrical installations and equipment principles and requirements to an extent indicated by the following aspects:

T1 Effects of electric current encompassing:

- Physiological effects of current.
- Basic principles by which an electric current can produce heat, light, motion and a chemical reaction.

T2 Single path practical circuit encompassing:

- Arrangement of energy source, protection device, switch and load in a circuit.
- The purpose of each component in the circuit.
- Consequences of an open-circuits, closed-circuits and short-circuits.

T3 Single-source multiple-path d.c. circuits encompassing:

- Circuit configurations and connection.
- Relationship between the parameters of voltage, current, resistance and power dissipation in the whole or any part of the circuit.
- Safely measuring the parameters for the whole or any part of the circuit.
- Methods of determining circuit behaviour for variation in any of the parameters from measured and calculated values.

T4 Alternating voltage and current generation, phase relationships, energy in an a.c. circuit encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Sinusoidal voltage generation and resulting current.
- The terms period; maximum value; peak-to-peak value; instantaneous value; average value; root-mean-square (r.m.s.) value; and frequency.
- Three-phases generation.
- Relationship between the phase voltages generated in a three-phase alternator and the conventions for identifying each.
- Method of determining the phase sequence or phase rotation of a three-phase supply.
- Methods of determining power and energy supplied by three phase circuits.

T5 Fundamental safety principles of the AS/NZS 3000 Part 1 (Section 1) and deemed to comply solution given in Part 2 encompassing:

- Definition of terms
- Fundamental safety principles of protection against direct and indirect contact with live parts; thermal effects; overcurrent; earth faults; abnormal voltages; spread of fire; mechanical injury and external influences.
- Fundamental principles of installation design; selection and installation of equipment; means of compliance (including alterations, additions and repairs) and verification of compliance.

T6 Electric motor selection, starting method and overload protection encompassing:

- Types of motor enclosures suitable for given environmental conditions
- Criteria for selecting motor starters and overload protection.
- Types and connection arrangements for direct-on-line and reduced voltage starters.
- Thermal, magnetic and thermistor overload protection methods.

T7 Ability to apply AS/NZ 3000 requirements for protective and functional earthing encompassing:

- Purpose of protective and functional earthing.
- Parts of the protective earthing systems.
- Earthing arrangements, earthing of equipment and equipotential bonding.
- Methods of determining the maximum fault loop impedance for a circuit.
- Selection of protective conductor and active conductor sizes for each circuit to ensure earth-fault loop impedance is sufficiently low to operate the circuit protective device.

T8 MEN system and its application encompassing:

- The roles of the protective earthing (PE) and neutral (N) conductors in an a consumer’s installation and their relationship to the protective earth neutral (PEN) conductor in the electricity distributor’s system or sub-main to an outbuilding.
- The importance of the MEN link when a fault occurs.
- The likely consequences of the absence of the MEN link or high impendence in the PEN conductor when a fault occurs.
- The requirements for installation of an MEN link in an installation and an outbuilding.

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REQUIRED SKILLS AND KNOWLEDGE

T9 Knowledge of the application of transformers encompassing:

- Transformers used in distribution and transmission systems and large consumer installations.
- Transformers used in welding machines.
- Applications in appliances
- Risks and safety control measures associated with connection and disconnection of instrument transformers
- Safe working procedures when connecting and testing transformers.
- AS/NZS 3000 requirements and restriction on the installation and use of transformers.

T10 Ability to apply AS/NZ 3000 requirements for protection of circuit against overcurrent and abnormal voltages encompassing:

- Minimum fault levels specified by electricity distributors
- Methods and arrangement for protection against short-circuit currents and overload currents.
- Coordination of overload and short-circuit protection devices.
- Coordination between conductors and overload protection devices.
- Causes of over and undervoltage.
- Device and requirements for protection against over and undervoltage.

T11 Additional protection by use of RCDs and use of extra-low voltage for basic and fault protection encompassing:

- Limitation of an RCD to protect against contact with live parts
- AS/NZS 3000 requirements for use of RCDs.
- Conditions for use of extra-low voltage to provide for basic and fault protection
- AS/NZS 3000 requirements for installation of SELV and PELV systems

T12 Ability to select cables for single and three phase mains and sub-mains for single and multiple installations that comply with requirements of AS/NZS 3000 and AS/NZS 3008.1 encompassing:

- Methods of determining maximum demand.
- Types of cables available.
- Installation methods and external influences effecting cable current-carrying capacity
- Voltage drop limitation
- Short-circuit performance consideration.

T13 Ability to select cables for final sub-circuits that comply with requirements of AS/NZS 3000 and AS/NZS 3008.1 encompassing:

- Maximum demand of final sub-circuits.
- Types of cables available.
- Installation methods and external influences effecting cable current-carrying capacity
- Effect of earth-fault loop impedance and voltage drop limitations on circuit route

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REQUIRED SKILLS AND KNOWLEDGE

length.

- Short-circuit performance considerations.

T14 Ability to apply AS/NZS 3000 requirements for control and protection of installations encompassing:

- Devices for functions of isolation; emergency; Mechanical maintenance and functional control.
- Method for assessing prospective short circuit current.
- Devices and arrangement for protection against overload and short-circuit current.
- Additional protection by RCD
- Protection against switchboard internal arc faults.

T15 Ability to apply AS/NZS 3000 requirements for the installation of electrical equipment in given damp situations encompassing:

- Limitation of installation of equipment in classified zones.
- Selection and location of equipment suitable for installation in given classified zones.
- Additional protection by RCD.
- Equipotential bonding in showers and bathrooms and swimming and spa pools.

T16 Ability to install, modify and test electrical equipment for construction and demolition sites, complying with AS/NZS 3012 and applicable workplace safety legislation encompassing:

- Supply and installation requirements.
- Protection of circuits.
- Initial and periodic inspection and testing
- Portable tool safety testing and tagging system in accordance with AS/NZS 3760.

T17 Knowledge of AS/NZS 3000 requirements for the installation of aerial conductors and underground wiring encompassing:

- Types and application of aerial conductors
- Aerial span limitations and required clearances
- Selection of aerial supporting poles/post and struts for a given application.
- Use and requirements of catenary support systems
- Acceptable cable types and protection for underground wiring categories.
- Underground wiring depth layer and protection
- Underground wiring clearances from other services

T18 Knowledge of AS/NZS 3000 requirements for electrical installations in hazardous areas encompassing:

- Types of areas classified as a hazardous area
- Standards to which the selection, installation and maintenance of electrical equipment shall comply.
- Additional training required to work competently with electrical equipment for hazardous areas

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REQUIRED SKILLS AND KNOWLEDGE

- T19 Ability to verify compliance of an electrical installation in accordance with AS/NZS 3000 encompassing:
- Visual inspection to determine whether the installation complies with requirements set out in Section 2 to 7 of AS/NZS 3000 and relevant specific installation standards.
- Mandatory tests following guidance given in AS/NZS 3017

T20 Ability to perform effective safe isolation of any equipment encompassing:

- Preparation of a 'safe work method statement' (SWMS) or Job Safety Analysis (JSA) for effective safe isolation.
- Safe methods for identifying source of supply to be isolated.
- Switching-off, lock-out and tagging procedures.
- Safe methods for confirming effective and safe isolation

T21 Ability to apply AS/NZS 3000 requirements to install and terminate thermoplastic insulated cables; elastomer sheathed cables; XLPE sheathed cables; and high temperature cables; armoured cables; and neutral screened cables in a wide range of applications.

T22 Ability to perform the circuit tests required for electrical cables in a range of installations and final sub-circuit encompassing:

- Following safe testing procedures.
- Tests to show if the earth continuity and earth-fault loop impedance are sufficiently low.
- Testing to show if insulation resistance is sufficiently high.
- Testing to show if the polarity and circuit connections are correct.

T23 Ability to install final sub-circuit wiring into switchboards and connect to switchboard equipment in accordance with AS/NZS 3000 and electricity distributor's requirements.

T24 Ability to apply AS/NZS 3000 and electricity distributor's requirements for the installation and connect consumers mains encompassing:

- Installing of underground and overhead consumers mains
- Terminating consumers mains at pillars, pits mains connection boxes and consumers switchboard.
- Install unprotected consumers mains to reduce the risk of short-circuit current to a minimum.
- Installing bonding conductors where required.

T25 Ability to read, sketch and interpret electrical diagrams encompassing:

- Purpose and characteristics of schematic, block and wiring diagrams, plans and schedules.
- Conventions used in documenting electrical information
- Read and interpret schematic, block and wiring diagrams, plans and schedules
- Sketch electrical diagrams using conventional symbols

T26 Knowledge and understanding occupational safety and health encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Basics of Occupational Safety and Health regulations
- Legal responsibilities for employers and employees
- Employers' and employees' own "duty of care".
- Safety committees and their role

T27 Knowledge and understanding of the requirements for personal safety in the workplace encompassing:

- Purpose and use of Safe Work Method Statements (SWMS) or Job Safety Analysis (JSA).
- Purpose and process of reporting OHS incidents.
- Safety procedures for working with electrical circuits and equipment.
- Procedures for safe and effective isolation of electrical supply.
- Regulations for the supervision of apprentices and trainees.

T28 Process in rescuing a person in contact with live electrical conductors or equipment and the primary importance of the safety of the rescuer.

T29 Application of emergency first aid requirements for an electric shock victim encompassing:

- Calling for help.
- Applying cardiopulmonary resuscitation (CPR).
- Selection and use of fire extinguishers to control electrical fire at accident site.

T30 Dangers of high voltage equipment and distribution systems encompassing:

- Step and touch and induced voltages.
- Sources of induced voltage and stored energy
- Creepage and clearance requirements.
- Application of safe working procedures in the vicinity of HV equipment.

T31 Systematic method of commissioning and decommissioning electrical equipment and installations encompassing:

- Commissioning safety procedures
- Circuit voltage testing
- Phase rotation checks
- Functional testing
- Instrument and control parameter settings
- Decommissioning safety procedures.
- Identification of circuits with their control and protection devices.
- Impact of isolation on other parts of an installation.
- Tagging, testing and earthing.
- Safe removal of equipment.

T32 Diagnosing and rectifying faults in electrical apparatus and associated circuits encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Faults such as open-circuit; short-circuit; incorrect connections; insulation failure; unsafe condition; apparatus/component failure; related mechanical failure;
- Apparatus such as control devices; fixed appliances/accessories; lighting; electrical machines motors and controls; socket outlets, transformers; protection and metering devices.
- Circuits such as those supplying fixed appliances; lighting; socket outlets; motors and controls circuits; transformers; electronic or computer based equipment.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to

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EVIDENCE GUIDE

be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Verify compliance and functionality of general electrical installations as described as described in 8) and including:

    A Selecting correct tools and testing equipment.

    B Identifying visual non-compliance defects.

    C Using effective methods for conducting mandatory and optional tests.

    D Identifying non-compliance from test results.

    E Identifying causes of non-compliance.

    F Completing mandatory reporting.

    G Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to verifying compliance and functionality of general electrical installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to verifying compliance and functionality of at least two general electrical installations comprising a main switchboard, supplying more than one circuit each for, lighting, socket outlets, and fixed appliances. One of the installations shall include a distribution board separate from the main switchboard and at least one circuit supplying a three-phase load and a safety system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.3) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.3) Literacy and numeracy skills

Competency Field **5**)

Electrical

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UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

Modification History

Release	Action	Core/Elective	Details	Points
3	Edit		In Pre-requisites, edit code to reflect correct unit title UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications	
3	Edit		In Pre-requisites, edit name to reflect correct unit title UEENEEE102A Fabricate, assemble and dismantle utilities industry components	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the termination of cables and cords and their conductors at accessories and current-using devices designed to operate at voltages up to 1,000 V a.c. or 1,500 V d.c. It encompasses working safely and to standards, understanding wiring system and cable types and applications, selecting appropriate termination accessories, preparing and terminating cables and cords, terminating cables/cord conductors and ensuring completed termination complies with requirements.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licensing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s)

2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to terminate cables, cords and conductors	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Health and safety risks are identified and established risk control measures and procedures in preparation

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ELEMENT		PERFORMANCE CRITERIA	
			for the work are followed.
		1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
		1.4	The junction box/ terminal enclosures and terminal types are inspected to select the type and size of cable and conductor termination devices needed.
		1.5	Tools, materials and testing devices needed to for terminating cables and cords are obtained in accordance with established procedures and checked for correct operation and safety.
2	Terminate cables, cords and conductors	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.3	Cable/cord ends are cut and sheath/insulation stripped with sufficient length to prevent stain on terminations and without undue waste.
		2.4	Cable glands/retaining devices are fitted and secured to ensure cable/cord cannot be pulled out of entry into junction box/ terminal enclosure
.		2.5	Conductors are prepared to suit the type of terminal at which there are to be connected.
		2.6	Conductors are terminated to ensure continuity across the terminal.
		2.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
3	Test terminated cables and cords	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Terminated cables are tested to ensure continuity

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ELEMENT	PERFORMANCE CRITERIA
	and insulation resistance comply with requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and terminating cables, cords and accessories for low voltage circuits.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EG106A Wiring systems types, application and terminations

Evidence shall show an understanding of wiring systems types, application and terminations to an extent indicated by the following aspects:

T1 Cable types and terminations encompassing:

- cable variates (single cables, flexible cables, flexible cords, shielded cables, armoured cables, ribbon cables, other similar and like cables)
- structural components of cables and their purpose (conductor material, stranding, insulation type, voltage rating, screening, sheathing, armour and serving)
- Australian and International colour standards for cords and cables
- construction of common cables
- identification of cords and cables by conductor size, type and rating
- application of various cords and cables types
- identification of hardware used in terminating cords and cables
- preparation and termination of cords and cables
- termination of cords and cables using crimp lugs, tunnel connectors, soldering and solderless lugs
- requirements to protect and support cables adequately (protection against mechanical damage, protection from adverse temperatures and corrosion and protection from magnetic field that may affect the performance of the cable).

T2 Cords, cables and plugs encompassing:

- selection of flexible cords for given applications
- preparation of cord ends for connection
- fitting standard three pin plug tops to a flexible cords
- fitting standard three pin extension sockets to a flexible cords
- connecting variety of plugs to different flexible cord types
- requirements of AS/NZS 3000 for flexible cords, cables and plugs
- using test equipment to test and locate various faults in flexible cords and cables.

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REQUIRED SKILLS AND KNOWLEDGE

T3 Flat TPS wiring systems encompassing:

- Australian Standards requirements for the termination and protection of flat TPS cable
- Installation of flat TPS cable in trunking and duct for the supply of socket outlets
- using flat TPS cable for lighting looms
- testing circuits to ensure they are safe and operate as intended

T4 Circular TPS wiring systems encompassing:

- Australian Standards requirements for the installation of circular TPS cable
- installation of circular TPS cables on cable ladder/tray
- installation of circular TPS cable
- testing circuits to ensure they are safe and operate as intended

T5 Thermoplastic insulated cables in non-metallic enclosures encompassing:

- Australian Standards requirements for the installation of non-metallic enclosures
- cutting and setting rigid non-metallic ducting, trunking and conduit and accessories
- installation of circuits using TPI cables in non-metallic enclosures
- testing circuits to ensure they are safe and operate as intended

T6 Thermoplastic insulated cables in metallic enclosures encompassing:

- Australian Standards requirements for the installation of metallic enclosures
- fitting metallic conduit to metallic trunking and accessories
- cutting, threading and setting metallic conduit
- installation of circuits using thermoplastic insulated cables in metallic conduit, ducting and trunking
- testing circuits to ensure they are safe and operate as intended

T7 Fire protection cabling and systems encompassing:

- Australian Standards requirements for the installation of fire protection cable and mineral insulated metal sheathed cables
- requirements when passing a wiring system through a fire rated wall or floor
- recognising different fire protection cable types including Pyrolex, Radox and MIMS
- termination of fire protection cable.
- installation of circuits using fire protection cable.
- testing circuits to ensure they are safe and operate as intended

T8 Steel wire armoured (SWA) cables encompassing:

- Australian Standards requirements for the installation of SWA cables
- identifying accessories used with SWA cables
- installation of circuits using SWA cables
- testing circuits to ensure they are safe and operate as intended

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REQUIRED SKILLS AND KNOWLEDGE

T9 Trailing cables and catenary systems encompassing:

- Australian Standards requirements for the installation of trailing cables and catenary wiring
- identifying equipment used with trailing cable and catenary systems
- installation of catenary wiring systems
- installation of trailing cable systems supplying pendant sockets
- testing the installation to ensure it is safe and operates as intended

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material

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EVIDENCE GUIDE

carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install wiring and accessories for low voltage circuits as described as described in 8) and including:

A Selecting appropriate cable/cord and conductor devices

B Cutting cable ends and stripping sheath/insulation to a sufficient length

C Fitting and securing cable glands/retaining devices correctly

D Preparing and terminating conducts to suit the type of terminal at which there are to be connected.

E Testing completed cables to ensure compliant continuity and insulation resistance

F Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing wiring and accessories for low voltage circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by terminating at least five different types of cables each at a junction box and a device terminal enclosure.

Cable types with copper conductors:

- Thermoplastic insulated cable (TPI)
- Flat thermoplastic sheathed (TPS)
- Circular thermoplastic sheathed (TPS)
- Steel wire armoured (SWA)
- Mineral insulated metal sheathed (MIMS)
- Flexible cables
- Flexible cords
- Aluminium conductor/cable

AND

Terminate their conductors at each of the follow

Terminal types

- Tunnel terminal
- Stud terminal
- Screw terminal

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5)**

Electrical

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UEENEEG107A Select wiring systems and cables for low voltage general electrical installations

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers selecting wiring systems and cables for electrical installations operating at voltages up to 1,000V a.c. or 1,500 V d.c. It encompass knowledge and application of wiring systems and cable types, selecting wiring system compatible with the installation conditions, selecting cables that comply with required current-carrying capacity and voltage drop and earth fault-loop impedance limitations, coordination between protective devices and conductors and documenting selection decisions

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107	Use drawings, diagrams, schedules,

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Prerequisite Unit(s) **2)**

A	standards, codes and specifications
UEENEEG006 A	Solve problems in single and three phase low voltage machines
UEENEEG033 A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063 A	Arrange circuits, control and protection for general electrical installations
UEENEEG101 A	Solve problems in electromagnetic devices and related circuits
UEENEEG102 A	Solve problems in low voltage a.c. circuit
UEENEEG106 A	Terminate cables, cords and accessories for low voltage circuits

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4)**

4.1) General Application

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

4.2) Importation

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to select wiring systems and cables for general electrical installations	1.1	The extent and nature of the electrical installation is determined from job specifications.
		1.2	Safety and other regulatory requirements to which the electrical installation shall comply area are identified, obtained and understood.
		1.3	Cable routes, the route lengths of cables and the conditions in which the wiring system is to operate is determined from job specifications or from consultation with appropriate persons.
2	Select wiring systems and cables for general electrical installations	2.1	Wiring systems are selected for suitability for the environments in which they are to operate.
		2.2	Cable conductor sizes are selected to meet current-carrying capacity requirements and voltage-drop and earth fault-loop impedance limitations.
		2.3	Circuit protective devices are selected to meet requirement for co-ordination with conductor current-carrying capacity.
		2.4	Earthing system components are selected to meet requirements of an MEN system.
		2.5	Evidence is obtained that electrical equipment selected complies with safety requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Document electrical installation.	3.1	Evidence is obtained from manufacturers/suppliers that electrical equipment selected complies with safety requirements.
	3.2	Reasons for selections made, including calculations, are documented in accordance with established procedures.
	3.3	Electrical installation arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of selecting wiring systems and cables for general electrical installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG107A Electrical installation — cable selection and co-ordination

Evidence shall show an understanding of selecting cables and ensuring co-ordination between protection device and conductors in electrical installations that comply with the Wiring Rules, Selection of cables standards and Service Rules to an extent indicated by the following aspects:

T1 Performance requirements - design and safety encompassing:

- harmful effects against which the design of an electrical installation must provide protection.
- performance standards of a correctly functioning electrical installation.
- supply characteristics that shall be considered when designing an electrical installation.
- acceptable methods for determining the maximum demand in consumer's mains and sub-mains.
- AS/NZS 3000 requirements limiting voltage drop in an installation.
- reason for dividing electrical installations into circuits and the factors that shall determine their number and type.
- typical external factors that may damage an electrical installation and that shall be considered in the installation design.
- methods for protecting persons and livestock against direct and indirect contact with conductive parts and the typical application of each.
- acceptable methods of protection against the risks of ignition of flammable materials and injury by burns from the thermal effects of current, in normal service.
- likely sources of unwanted voltages and the methods for dealing with this potential hazard.
- acceptable methods for protecting persons and livestock against injury and property against damage from the effects of over current.
- requirement for protection against fault current.
- requirement for protection against the harmful effects of faults between live parts of circuits supplied at different voltages.
- need for protection against injury from mechanical movement and how this may be achieved.

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REQUIRED SKILLS AND KNOWLEDGE

- features of 'fire rated construction' and how the integrity of the fire rating can be maintained in relation to electrical installation.

T2 Final subcircuit arrangements encompassing:

- factors that shall be considered in determining the number and type of circuits required for an installation.
- daily and seasonal demand for lighting, power, heating and other loads in a given installation.
- number and types of circuits required or a particular installation.
- current requirements for given final subcircuits.
- layout/schedule of circuits for given installations.

T3 Factors affecting the suitability of wiring systems encompassing:

- wiring systems typically used with various construction methods and particular environments.
- installation conditions that may affect the current-carrying capacity of cables.
- external influences that may affect the current-carrying capacity and/or may cause damage to the wiring system.
- AS/NZS 3000 requirements for selecting wiring systems for a range of circuits, installation conditions and construction methods into which the wiring system is to be installed. Note: Wiring systems include cable enclosures, underground wiring, aerial wiring, catenary support, emergency systems, busbar trunking and earth sheath return.

T4 Maximum demand on consumer’s mains/submains encompassing:

- acceptable methods for determining the maximum demand on an installation’s consumer’s mains and submains.
- maximum demand for the consumer's mains for given installations up to 400 A per phase.
- maximum demand for given submains.

T5 Cable selection based on current carrying capacity requirements encompassing:

- installation conditions for a range of wiring systems and applications.
- external influences that require the use of a derating factor.
- AS/NZS 3000 requirements for coordination of cables and protection devices.
- AS/NZS 3008 used to select conductor size based on the maximum current requirement for a given installation condition including any applicable derating factors.

T6 Cable selection based on voltage drop requirements encompassing:

- AS/NZS 3000 requirements for maximum voltage drop in an installation.
- relevant tables in AS/NZS 3008 for unit values of voltage drop.
- calculation of the expected voltage drop in a given circuit.
- selecting cables to satisfy voltage drop requirements in addition to current carrying capacity requirements.

T7 Cable selection based on fault loop impedance requirements encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- AS/NZS 3000 requirements for maximum fault loop impedance in an installation.
- relevant tables in AS/NZS 3008 to determine cable impedances.
- calculation of the expected fault loop impedance for a given circuit arrangement.
- selecting cables to satisfy fault loop impedance requirements in addition to current carrying capacity requirements and voltage drop requirements.

T8 Selecting protection devices encompassing:

- acceptable methods of protection against indirect contact.
- AS/NZS 3000 requirements for selecting methods and devices to protect against indirect contact for a range of installation types and conditions.
- coordination between conductors and protection devices to ensures the protection of cables from over heating due to over current.
- possible injuries to persons and livestock from hazards due to a short circuit.
- AS/NZS 3000 requirements for selecting devices to protect against overload current for a range of circuits and loads.
- AS/NZS 3000 requirements for selecting devices to protect against short-circuit current for a range of installation conditions.

T9 Selecting devices for isolation and switching encompassing:

- requirements for the provision of the isolation of every circuit in an electrical installation.
- need for protection against mechanical movement of electrically activated equipment.
- AS/NZS 3000 requirements for selecting devices for isolation and switching for a range of installations and conditions.

T10 Switchboards encompassing:

- AS/NZS 3000 and local supply authority requirements for switchboards.
- tariff structures for the supply of electricity.
- equipment installed at the main switchboards with capacities up to 400 A per phase.
- layout of a main switchboard for an installation supplied with single phase single tariff whole current metering.
- layout of a main switchboard for an installation supplied with single phase multiple tariff whole current metering.
- layout of a main switchboard for an installation supplied with multiphase single tariff whole current metering.
- layout of a main switchboard for an installation supplied with multiphase multiple tariff whole current metering.
- layout of a main switchboard for a multiple tenancy installation with whole current metering.
- layout of a main switchboard, including metering, for an installation supplied with three phase CT metering.
- local supply authority requirements for connection of an electrical installation to the electrical supply system

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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EVIDENCE GUIDE

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Selecting wiring systems and cables for general electrical installations as described as in 8) and including:

    A Determining the extent and nature of the installation for job specifications

    B Obtaining and understand the safety and other regulatory requirements to which the electrical installation shall comply

    C Determining cable routes, the route lengths of cables and the conditions in which the wiring system is to operate.

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EVIDENCE GUIDE

D Selecting wiring system suitable for the environment requirements.

E Selecting cable conductors sizes in consideration to current-carrying capacity and voltage-drop / earth fault-loop limitation.

F Ensuring co-ordination between circuit protective device and conductor current-carrying capacity.

G Selecting compliant earthing system components

H Documenting wiring systems and cables to be used, specification for items selected and reasons for the selections made.

I Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to selecting and arranging equipment for general electrical installations.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEE063A	Arrange circuits, control and protection for general electrical installations

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to selecting and selecting wiring systems and cables for at least two general electrical installations comprising a main switchboard, supplying more than one circuit each for, lighting, socket outlets, and fixed appliances. One of the installations shall include a distribution board separate from the main switchboard and at least one circuit supplying a three-phase load and a fire pump.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Electrical

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UEENEEG108A Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers trouble-shooting and repairing faults in electrical apparatus and interconnecting circuits and equipment operating at voltages up to 1,000 V a.c. or 1,500 V d.c. It encompasses working safely, reading circuit diagrams, sketching diagrams from traced wiring, logically applying fault finding procedures, conducting repairs and completing the necessary service documentation.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licensing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three

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Prerequisite Unit(s) **4)**

	phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical license.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to trouble-shoot and rectify faults.	1.1	The extent and nature of the electrical installation is determined from job specifications.
		1.2	Safety and other regulatory requirements to which the electrical installation shall comply area are identified, obtained and understood.
		1.3	OHS procedures for a given work area are identified, obtained and understood.
		1.4	OHS risk control measures and procedures in preparation for the work are followed.
		1.5	The likely extent of work to be undertaken is envisaged from fault/breakdown reports and/or discussions with appropriate person(s).
		1.6	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
2	Trouble-shoot and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.

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ELEMENT		PERFORMANCE CRITERIA	
		2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Trouble-shooting is approached methodically drawing on knowledge of electrical circuits and apparatus using measured and calculated values of circuit/apparatus parameters.
		2.6	Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
		2.7	Faulty circuits/components are rechecked and their fault status and acquired.
		2.8	Materials/replacement parts required to rectify faults are sourced and obtained in accordance with established procedures.
		2.9	Effectiveness of the repair is tested in accordance with established procedures.
		2.10	Apparatus is reassembled, finally tested and prepared for return to service.
		2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.12	Trouble-shooting and repair activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Completion and report trouble-shoot and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Written justification is made for repairs to apparatus.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and trouble-shooting and repairing faults in electrical apparatus and circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG108A Electrical circuit and equipment faults and fault finding techniques

Evidence shall show an understanding of electrical circuit and equipment faults and fault finding techniques to an extent indicated by the following aspects:

T1 Troubleshooting concepts encompassing:

- need to understand the correct operation of a circuit or equipment, switching and control circuit arrangements.
- common faults with circuits and equipment including operator faults, incorrect connections, open-circuits, short-circuits, device faults (mechanical), supply faults.
- typical faults symptoms and their causes: operation of circuit protective device, appliance does not operate, single phase motor does not develop enough torque to drive the load, three phase motor does not develop enough torque to drive the load, motor overload trips
- factors to consider in clarifying the nature of a fault: initial fault report, confirmation of symptoms of the fault, comparison of symptoms with normal operation
- effect to cause reasoning — assumptions of possible causes
- methods for testing assumptions: visual inspection, component isolation, test equipment, sectional testing, split-half tests
- repairing the fault and the steps needed to ensure fault doesn’t re-occur
- dealing with intermittent faults (typical causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference).
- final testing and re commissioning

T2 Troubleshooting water heater and appliance circuits/equipment encompassing:

- circuit diagrams of common single phase and three phase hot water systems
- single phase and three phase element resistance values (determined from measurement and calculation from power and voltage ratings)
- testing single and three phase elements for correct insulation resistance and continuity
- element replacement techniques
- operation of thermostats, thermal cut-outs and pressure relief valves, flow switches and checking sacrificial anodes

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REQUIRED SKILLS AND KNOWLEDGE

- locating faults in common single and three phase hot water systems
- repairing faulty water heating systems

T3 Troubleshooting electrical appliance circuits/equipment encompassing:

- circuit diagrams of common single phase and three phase appliances
- methods to determine the cause of an RCD operation
- identification of appliances that is causing an RCD to trip
- testing single and three phase appliances for correct insulation resistance and continuity
- operation of appliances controls
- locating faults in common single and three phase appliances
- repairing faulty appliances

T4 Troubleshooting lighting circuits encompassing:

- circuit and wiring diagrams of common lighting circuits including single light controlled by a single switch, multiple lights controlled by a single switch, two and three way switching using the loop at the light method and the loop at the switch method.
- causes of wiring faults from supplied symptoms and circuit and/or wiring diagrams
- causes of faults in ELV lighting devices, include transformer (iron core or electronic), voltage drop, heat, over-voltage, poor connections, incompatible dimmers
- diagrams of a basic fluorescent light circuit including lamp, ballast and starter
- locating faults in fluorescent light circuits
- operation of a range of lighting control including passive infra-red (PIR), dimmers, photo electric or day-light switches and time clocks
- locating faults in lighting control circuits

T5 Troubleshooting single phase motor and control circuits encompassing:

- circuit diagrams of split phase, capacitor start, capacitor start capacitor run, universal and shaded pole single phase motors
- causes of single phase motor faults from supplied symptoms and circuit diagrams
- causes of electrical faults in single phase motors, include open and partially open circuit winding, short and partially short circuit winding, open circuit rotor, burnt out winding, coil shorted to frame.
- reasons for a thermal overload trip and how often they are to be reset before investigating a cause
- internal mechanical faults and their consequences, include bearings, fans, bent shaft, locked rotor, blocked air vents, centrifugal switches, environmental factors
- faults on driven loads and couplings and their consequences, include slipping belts, poorly aligned coupling (shims), vibration, loads bearing failing, load stalling.
- locating faults in single phase motors and their controls

T6 Troubleshooting three phase induction motor encompassing:

- circuit diagrams of three phase induction motors
- causes of three phase motor faults from supplied symptoms and circuit diagrams
- causes of electrical faults in three phase motors, include open and partially open circuit

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REQUIRED SKILLS AND KNOWLEDGE

phase winding, short and partially short circuit phase winding, open circuit rotor, burnt out phase winding, coil shorted to frame.

- reasons for a thermal overload trip and how often they are to be reset before investigating a cause
- internal mechanical faults and their consequences, include bearings, fans, bent shaft, locked rotor, blocked air vents, environmental factors.
- faults on driven loads and couplings and their consequences, include slipping belts, poorly aligned coupling (shims), vibration, loads bearing failing, load stalling.
- locating faults in three phase induction motors and their controls

T7 Troubleshooting electrical installations encompassing:

- circuit diagrams, wiring diagrams, cable schedules and specifications of electrical installations
- causes of electrical installation faults from supplied symptoms and circuit diagrams include open and partially open circuit wiring, short and partially short circuit wiring, low insulation resistance, incorrect polarity, transposition of conductors, RCD tripping.
- locating faults in electrical installations
- repairing faulty electrical installation circuits components and wiring.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and

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EVIDENCE GUIDE

regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in electrical apparatus and circuits as described as described in 8) and including:

A	Envisaging the likely extent of the fault and the work from fault/breakdown reports and/or discussion to elicit information on the fault/breakdown with appropriate person(s).
B	Using appropriate tools and resources, and methodical fault finding techniques.
C	Locating and trouble-shooting faults efficiently.
D	Conducting tests or measurements in strict accordance with OHS and electrical safe working requirements.
E	Rectifying faults effectively.
F	Reporting cause of the fault and justifying the repairs undertaken.
G	Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to trouble-shooting and repairing faults in electrical apparatus and circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG109A	Develop and connect electrical control circuits t

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in trouble-shooting and repairing faults in electrical apparatus and circuits designed for voltages up to 1000 V a.c. or 1500 V d.c in at least:

Four of the following **equipment and associated circuit**

- Switchboards
- Protective devices
- Lighting
- Heating
- Socket outlets
- Control devices

and

Three of the following **machines and associated control circuits**

- Single phase motors
- Single phase motor controls
- Three phase motors
- Three phase motor controls
- Synchronous machines
- DC machines
- DC machines controls
- Transformers and auxiliary components

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RANGE STATEMENT

Notes.

1. The different types of faults include; Open-circuit; Short-circuit; Incorrect connections; Insulation failure; Unsafe condition; Apparatus/component failure; Related mechanical failure; Other electrical apparatus and circuit faults

2. Examples of apparatus are Control devices; Fixed appliances/accessories; Lighting; Single phase motors and their controls; Socket outlets Three phase motors and their controls, synchronous machines and their controls, transformers and their controls, switchboards and/or distribution boards and their controls, protection and/or metering devices, a.c./d.c. machines and their controls other like equipment/accessories.

3. Examples of circuits include those supplying fixed appliances; lighting; single-phase motors; socket outlets; three phase motors and controls circuits; machines and transformers; electronic or computer based equipment other like equipment/accessories.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5)**

Electrical

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UEENEEG109A Develop and connect electrical control circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers developing, connecting and functionally testing electrical power and control circuits that perform specific control functions. It encompasses working safely; developing schematic/ladder diagrams and converting them to wiring diagrams; selecting and connecting contactors and control devices to perform a specific function.

Application of the Unit

Not Applicable

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Licensing/Regulatory Information

1.2) License to practice

During Training: Competency development activities are subject to regulations directly related to licensing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG063A	Arrange circuits, control and protection for general electrical installations

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Prerequisite Unit(s) **2**)

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit **4**)

4.1) **General Application**

This unit applies to all qualifications, competencies and/or Skill Sets which require an electrical license.

4.2) **Importation**

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Develop and prepare to connect electrical control circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	Control scenarios are determined from discussions with appropriate person(s) and documented in accordance with established procedures.
	1.5	Agreement for the control scenarios is sought from appropriate person(s) and documented in accordance with established procedures.
	1.6	Schematic arrangement of control circuits that complies with agreed scenarios is documented in accordance with established procedures.
	1.7	Materials needed to connect control circuits are obtained in accordance with established procedures and checked against job requirements.
	1.8	Tools, equipment and testing devices needed to connect control circuits are obtained in accordance with established procedures and checked for correct operation and safety.
	1.9	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2 Connect and test electrical control circuits.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Control circuit components are connected to comply with the agreed control scenario.
	2.5	Control circuit operation is tested for agreed functionality and in strict accordance with OHS requirements and established safety procedures.
	2.6	Non-compliant control functions are rectified to comply with the agreed control scenario.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Control circuits are connected and tested efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practice.
3 Completion and document circuit development activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	'As-connected' control circuits are documented using standard drawing conventions and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing and connecting control circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG109A Electrical control devices and circuits

Evidence shall show an understanding of electrical control devices and circuits to an extent indicated by the following aspects:

T1 Basic relay circuits encompassing:

- Identification of given circuit diagrams (schematic) symbols and explain the operation of the components represented
- labelling wires and terminal (numbering systems)
- control relay - operating principles, basic contact configurations and identification and common applications
- push button - switching configurations and common applications
- selecting pushbuttons/pilot lamps from manufacturer’s catalogues for specific applications
- development of simple stop-start relay circuit that incorporates pilot lights and latching circuit.
- connection and testing of control circuits

T2 Relay circuits and drawing conventions encompassing:

- circuit diagram drawing conventions
- selecting relays from manufacturers’ catalogue for specified applications
- circuit development of electrical control circuit in accordance with a written description (specification) and list the sequence of operation of the circuit
- connecting simple electrical control circuit from circuit diagrams
- applying safe working practices when testing an electrical control circuit

T3 Remote STOP-START control and electrical interlocking encompassing:

- operation of local and remote start-stop control of relays
- operation of an electrically interlocked relay circuit
- development of a relay circuit incorporating local and remote start and stop buttons and electrical interlocking.
- connecting electrical circuits with local and remote start-stop control and with electrical interlocking.

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REQUIRED SKILLS AND KNOWLEDGE

- applying circuit checking and testing techniques to an electrical control circuit.

T4 Time delay relays encompassing:

- timers - operating principles, basic contact configurations and identification and common applications
- selecting timers for specified functions from manufactures' catalogues
- development of timer controlled circuits from a written description and list the sequence of circuit operation
- connecting a timer controlled circuit using a circuit diagram as a guide.
- timer circuit checking and testing procedures.

T5 Circuits using contactors encompassing:

- contactors - operating principles, basic contact configurations and identification and common applications
- thermal overloads - operating principles, basic contact configurations and identification and common applications
- circuit diagram symbols
- circuit development using a contactor
- using contactors for motor control.
- compliance requirements for devices for isolating circuits.

T6 Jogging and interlocking encompassing:

- purpose and application of jogging control of motors
- operation of motor control using start, stop and jog buttons
- purpose and application of electrical/mechanical interlocking
- developing a multiple motor starting circuit from a description of the circuit operation including jog and interlock functions.
- selecting circuit components using manufacturers' catalogues for appropriate duty ratings
- connecting and testing a multiple motor starting circuit which incorporates start, stop and jog control.

T7 Control devices encompassing:

- common control devices used in automatic control circuits: limit switches, proximity switches, photoelectric cells, pressure switches, float switches, light sensors and temperature sensors
- basic operating principles of common control devices
- advantages and disadvantages of common control devices
- applications for common control devices
- selecting control devices using manufacturers' catalogues for specified applications
- connection of control devices into control circuits

T8 Programmable relays encompassing:

- programmable relays - advantages over electromagnetic relay circuit control.

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REQUIRED SKILLS AND KNOWLEDGE

- typical applications of programmable relays.
- block diagram representation and basic operating principles
- input and output parameters, listing, connections and output types.
- connecting input and output devices to a programmable relay using a diagram
- basic programming of ladder circuits consisting of inputs, outputs i.e. stop-start circuit
- using the monitoring facility of the programmable relay to verify each ladder circuit operation.
- programming timers and using the monitoring facility of the programmable relay to check the values of the timer
- external devices
- implications of programming normally closed field devices
- conversion of control circuits
- installation of programmable control relays
- common faults and their symptoms

T9 Three-phase induction motor starters encompassing:

- reasons for limiting the starting current of large motors.
- requirements of the wiring rules (AS/NZS 3000) and the local supply authority service rules, with regard to starting and control of induction motors.
- DOL starter operating principles, applications and circuits
- electronic (soft) starter operating principles, applications and circuits
- connecting a DOL motor starter and testing the operation of the power and control circuits
- installation of DOL and soft starters

T10 Three-phase induction motor starters- reduced voltage encompassing:

- star-delta starter operating principles and circuits
- primary resistance starter operating principles and circuits
- auto-transformer starter operating principles and circuits
- secondary resistance starter operating principles and circuits
- common applications for each starter type
- comparison of motor starters basic characteristics
- selecting the most suitable motor starter for a given situation
- connecting motor starter power and control circuits for correct operation
- measuring starting current and torque of selected motor starters
- installation of reduced voltage starters

T11 Three-phase induction motor reversal and braking encompassing:

- reversing operating principles and control circuits
- plug braking operating principles and circuits
- dynamic braking operating principles and circuits
- regenerative braking operating principles and circuits

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REQUIRED SKILLS AND KNOWLEDGE

- eddy current brakes operating principles and circuits
- mechanical brakes operating principles and circuits
- comparison of the difference braking methods used.
- typical applications for each braking method.
- connecting a circuit with a braking feature to operate a three-phase motor.
- installation of motor braking control circuits

T12 Three-phase induction motor speed control encompassing:

- pole changing operating principles and circuits
- variable frequency drives operating principles and circuits
- slip-ring motors operating principles and circuits
- installation of motor speed controllers.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required

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EVIDENCE GUIDE

and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop and connect control circuits as described as described in 8) and including:

    A Determining control scenarios specifications.

    B Developing schematic arrangement of control circuits that meets the required scenario as specified.

    C Connecting control circuit to function as specified.

    D Conducting safety and functional testing correctly

    E Identifying and correcting non-compliant control functions.

    F Documenting 'as-connected' control circuit.

    G Dealing with unplanned events

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to development and connecting electrical control circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG108B	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing, connecting and safety and functional testing on more than one occasion of at least four of the following control circuits:

- Multiple light switching circuit
- Master control circuit
- Single stop-start circuit
- Multiple stop-start circuit
- Time controlled circuit
- Machine interlocked circuit
- Motor jogging circuit
- Machine safety circuit

and,

using at least five of the following devices

- Multi-way switches
- Switches with more than two positions and Off
- Push buttons
- Electromechanical relays
- Programmable relays
- Contactors
- Reversing contactors
- Three phase starters
- Reduced voltage starters

and

with at least two of the following transducers/sensors:

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RANGE STATEMENT

- Timers
- Limit switches
- Proximity switches
- Photoelectric cells
- Pressure switches
- Float switches
- Light sensors
- Temperature sensors

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5)**

Electrical

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UEENEEG110A Find and repair faults in LV d.c. electrical apparatus and circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers finding and repairing faults in electrical apparatus and interconnecting circuits and equipment operating at voltages up to 1,500 V d.c. It encompasses working safely, reading circuit diagrams, sketching diagrams from traced wiring, applying logical fault finding procedures, conducting repairs and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures in preparation for the work are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	The likely extent of work to be undertaken is envisaged from fault/breakdown reports and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	2.5	Fault finding is approached methodically drawing on knowledge of d.c. circuit and apparatus using measured and calculated values of circuit/apparatus parameters.
	2.6	Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.7	Faulty circuits/components are rechecked and their fault status and acquired.
	2.8	Materials/replacement parts required to rectify

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ELEMENT	PERFORMANCE CRITERIA	
		faults are sourced and obtained in accordance with established procedures.
	2.9	Effectiveness of the repair is tested in accordance with established procedures.
	2.10	Apparatus is reassembled, finally tested and prepared for return to service.
	2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.12	Fault finding and repair activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.
	3.3	Maintenance work activities are documented in accordance with established procedures. Note. Examples of documentation are component faults reports, test results, authorisations, permits, parts/component dispatch and stores records.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in LV d.c. electrical apparatus and circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG110A Direct current machines and controls

Evidence shall show an understanding of d.c. motor control methods to an extent indicated by the following aspects:

T1 Direct current machines encompassing:

- Purpose, types and applications
- Operating principles
- Installation and starting/running requirements and limitations
- Connection arrangements
- Typical fault symptoms and related conditions

T2 Direct current motor starters and their operating principles encompassing:

- back emf
- series-lockout
- timed starters
- electronic controllers

T3 Power and control connection arrangements encompassing:

- Built-in stop/start control
- Remote stop/start control
- Overload protection
- Interlocking with other starters and controls

T4 Braking methods encompassing:

- Dynamic,
- Plugging,
- Electromechanical, and
- Regenerative.

T5 Speed control methods encompassing:

- Field control
- Rheostatic control

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REQUIRED SKILLS AND KNOWLEDGE

- Voltage control

T6 Protection of d.c. motors

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in d.c. electrical apparatus and

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circuits as described in 8) and including:

A Envisaging the likely extent of work from fault/breakdown reports and discussion with appropriate person(s).

B Using methodical fault finding techniques.

C Finding faults efficiently.

D Rectifying faults effectively.

E Completing documentation correctly.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in d.c. electrical apparatus and circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is

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expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG109A Develop and connect electrical control circuits

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to finding and repairing faults and their cause in d.c. electrical apparatus and circuits. Finding and repairing fault types in electrical apparatus and interconnecting circuits and equipment operating at voltages up to d.c include the following:

- Open-circuit
- Short-circuit
- Incorrect connections
- Insulation failure
- Unsafe condition
- Apparatus/component failure
- Related mechanical failure
- Other electrical apparatus and circuit faults
- Any five of the above shall apply.

Note:

1. Examples of apparatus are d.c switchboards/distribution boards, protective devices such as circuit breakers and fuses, and d.c machines and associated control devices.

2. Examples of circuits include those related to d.c. apparatus; d.c machines and controls circuits.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG111A Carry out basic repairs to electrical components and equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit deals with the repair and/or replacement of mechanical and electrical components of electrical apparatus. It encompasses safe working practices, following written and oral instruction and procedures, basic testing and techniques for dismantling and assembling apparatus and disconnecting and reconnecting components

Application of the Unit

Application of the Unit

2)

This unit may apply to persons entering work in electrotechnology and may be used in school based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101 A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102 A	Fabricate, assemble and dismantle utilities industry components

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair electrical apparatus.	1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The nature of the repair is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established routines and procedures.
	1.6	Tools, apparatus and testing devices needed

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ELEMENT	PERFORMANCE CRITERIA	
		to carry out the work are obtained and checked for correct operation and safety.
2 Repair electrical apparatus.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Apparatus is dismantled in accordance with manufacturer's guide and supervisor's instructions.
	2.5	Component parts are tagged during the dismantling to help ensure correct and efficient reassembly and stored to protect them against loss or damage.
	2.6	Repairs are affected efficiently without damage to other components, apparatus or circuits.
	2.7	Apparatus is assembled in an appropriate sequence with all components parts placed, secured and connected in accordance with manufacturer's guide or industry practice.
	2.8	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.9	Repairs are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and report repair work activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Repaired apparatus is prepared and forwarded to appropriate person(s) for testing.
	3.3	Work area is cleaned and made safe in accordance with established procedures.
	3.4	Work supervisor is notified of the completion of the repair work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out basic repairs to electrical apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG111A Electrical basic equipment repair

Evidence shall show an understanding of electrical workshop and metal cutting and an ability to carry out those activities to an extent indicated by the following aspects:

T1 Basic cable and conductor terminations encompassing:

- Insulation removal and replacement
- General aspects and soldering involving pins on electronic components and stranded conductors carrying current up to 25 amperes.
- Application of connecting devices for conductors and terminals
- Continuity through connections and insulation resistance testing
- Stress release on cables/conductors

T2 Electrical workshop machines encompassing:

- Fixed position power tools
- Tooling used on drilling machines
- Twist drills features, sharpening and faults
- Drilling operations
- Off hand grinding safety and machine set up

T3 Principles of metal cutting encompassing:

- Factors influencing the action of cutting tools
- Principles of chip formation
- Effects of cutting tool geometry
- Effects of coolants and cutting fluids

T4 Selection of cutting tools encompassing:

- Factors influencing tool selection
- Cutting tool materials
- Turning cutting tool design
- Milling cutting tool design

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REQUIRED SKILLS AND KNOWLEDGE

- Principles of chip control
- Identification and selection of carbides

T5 Metal cutting conditions encompassing:

- Conditions under which tools cut best
- Determining cutting data

T6 Cutting tool defects encompassing:

- Identification of types of tool failures
- Causes of tool failure

T7 Overcoming causes of tool failure

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

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access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out basic repairs to electrical apparatus as described as described in 8) and including:

A Following manufactures service instructions for access to components.

B Removing at least three different types of components specified in the work instructions.

C Replacing components to manufacturer's requirements.

D Terminating internal wiring correctly.

E Reassembling the apparatus correctly.

F Testing apparatus operation.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal

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learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out basic repairs to electrical apparatus.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) 8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out basic repairs electrical apparatus limited to replacement or repair of components in which the fault has been previously established. This shall include at least two different electrical apparatus in which three different types of components are faulty one of which requires disconnecting and reconnecting internal wiring to affect repairs.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG113A Install and maintain emergency safety systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the installation and maintenance of fire and smoke control, emergency supplies and early warning systems in buildings and premises. It encompasses working safely and to installation and maintenance standards, complying with maintenance schedules and completing the necessary documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work

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License to practice **3)**

platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits

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Prerequisite Unit(s) **4)**

UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills **5)**

qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and maintain emergency safety systems	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Installation/maintenance is prepared in consultation with other affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or appropriate person to establish the scope of work to be undertaken.
	1.6	Location of apparatus and associated equipment is planned within the constraints of the building structure, significants and regulations.
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.

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ELEMENT		PERFORMANCE CRITERIA	
		1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
		1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.10	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2	Install and maintain emergency safety systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Apparatus and associated equipment are installed and maintained to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance.
		2.5	Wiring is terminated at apparatus and associated equipment in accordance with manufacture's specifications and functional and regulatory requirements.
		2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.8	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.9	Apparatus installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
3 Completion and report installation and maintenance activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to that the installed and maintained apparatus conforms to requirements.
	3.4	'As-installed' emergency safety systems apparatus and associated equipment is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining emergency safety systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG113A Electrical installations, emergency safety systems

Evidence shall show an understanding of installing and maintaining electrical emergency safety systems to an extent indicated by the following aspects:

T1 Cells and batteries in common use encompassing:

- Primary cells
- Secondary cells
- Discharging
- Recharging
- Terminal voltages
- Capacity
- Discharge and recharge characteristics
- Battery configurations and applications
- Cell and battery safety practices.

T2 Electrical installations, emergency systems encompassing:

- Principles and practices of electrical emergency safety systems for electrical installations as contained in relevant Australian Standards, Australian building code and associated hazards documentation
- Arrangement and requirements for fire and smoke control equipment
- Arrangement and requirements for emergency warning and intercommunications systems
- Arrangement and requirement for emergency power supplies

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain emergency safety systems as described in 8) and including:

A Determining the operating parameters of existing electrical safety systems.

B Using established problem solving methods.

C Directing personnel to take relevant measurements.

D Interpreting measured values appropriately.

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E Providing effective solutions to electrical safety system problems.

F Giving written justification of solutions provided.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and maintaining emergency systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to fire and smoke control, warning systems and emergency supplies.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG116A Diagnose and rectify faults in traction lift systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers diagnosing and rectifying faults in traction lift systems and equipment. It encompasses working safely, replacing and/or adjustment of lift circuit and associated components, diagnosing and repairing of faults in lift circuits and associated components (including governors, brakes, safety gear, safety devices, lift machines, door components and controllers) and releasing passengers from lifts which have become immobilised.

Application of the Unit

Application of the Unit **2)**

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of

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License to practice **3)**

training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

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Prerequisite Unit(s) **4)**

UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The likely extend of work to be undertaken is envisaged from maintain procedures or fault/breakdown reports and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measured and devised and implemented in consultation with appropriate personnel.
	2.5	Logical diagnostic methods are applied to diagnose lift system apparatus faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.6	Suspected fault scenarios are tested as being the cause(s) of system fault.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Cause of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the lift systems.
	2.8	Faults in the lift components of the system are rectified to raise apparatus and system to its operational standard.
	2.9	System is tested to verify that the system operates as intended and to specified requirements
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Completion and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.
	3.3	Rectification of faults is documented in accordance with established procedures. Note. Examples of documentation are components fault reports, test results, authorisations, permits, parts/component dispatch and store records
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in lifts systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG116A Traction lift systems

Evidence shall show an understanding of the operation of the various types of lifts and the emergency procedures for the release of trapped passengers to an extent indicated by the following aspects:

T1 Technical standards, regulations and codes for lifts and escalators encompassing:

- Lift Code
- Australian Standards relevant to lift systems

T2 Lift systems – drive types, construction and operation of passenger, goods and service lifts encompassing:

- Drive types
- Drive constructions
- Drive operations
- Single and team manual handling
- Communication on site
- Emergency procedures
- Passenger
- Goods
- Service

T3 Lift machine room encompassing:

- access
- Machine
- Controller
- Governor
- Floor selector

T4 Lift well equipment encompassing:

- Guide rails
- Landing doors and locks
- Limit switches/operating devices
- Ropes

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REQUIRED SKILLS AND KNOWLEDGE

- Roping systems
- Counterweights

T5 Lift pit encompassing:

- access
- Buffers
- Compensators
- Safety equipment

T6 Lift car encompassing:

- access
- Frame
- Superstructure
- Door operator
- Travelling cable
- Buttons and indicators
- Communication devices
- Safety gear

T7 Lift control circuits using relay logic encompassing:

- Button circuit
- Indicator/lantern circuit
- Key switch circuits
- Fans
- Mains supply
- Power circuits
- Floor selector circuitry
- Motor room control (selector)
- Well control (transducer)
- Directional circuitry
- Slowing and stopping circuitry
- Re-levelling circuitry
- Door operator circuitry
- Acceleration circuits

T8 Lift safety circuits encompassing:

- Landing door locks
- Car door locks
- Emergency stop
- Pit switch
- Car trap-door limit switch
- Fire service

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REQUIRED SKILLS AND KNOWLEDGE

- Car top switch
- Tappet switch
- Governor/switch
- Safety gear switch
- Reverse phase relay
- Phase failure relay
- Overloads
- Circuit breakers
- Limit switches
- Terminal stopping
- Door protection
- Circuit switches

T9 Lift components - electro-mechanical employing relay logic encompassing:

- Button circuit
- Indicator/lantern circuit
- Key switch circuits
- Fans
- Mains supply
- Power circuits
- Floor selector circuitry
- Motor room control (selector)
- Well control (transducer)
- Directional circuitry
- Slowing and stopping circuitry
- Re-levelling circuitry
- Door operator circuitry
- Acceleration circuits

T10 Lift components - electro-mechanical safety circuits encompassing:

- Landing door locks
- Car door locks
- Emergency stop
- Pit switch
- Car trap-door limit switch
- Fire service
- Car top switch
- Tappet switch
- Safety gear switch
- Terminal stopping
- Circuit switches are all highlighted

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REQUIRED SKILLS AND KNOWLEDGE

T11 Lift components - electronic encompassing:

- Encoders
- Transducers
- Electronic boards
- Selectors
- Rectifiers
- Capacitors
- Resistors
- Processor board
- I/O board

T12 Lift components – electrical encompassing:

- Relays; reverse phase and phase failure
- Tachos
- Limit switches
- Brushes
- Selectors
- Motor/generator
- Transformers
- Fuses
- Lamps
- Terminals

T13 Lift electrical layout and special requirements encompassing:

- Lift Code and AS 3000 requirements
- Special lift symbols
- Conduits
- Travelling cable
- Troughing
- Colour coding and labelling
- Segregation LV/ELV
- Communication cabling

T14 Traction encompassing:

- Speed/load characteristics
- Efficiency
- Application
- Brakes
- Electric prime mover (motor types and control)

T15 Geared types including rack and pinion and chain encompassing:

- Speed/load characteristics

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REQUIRED SKILLS AND KNOWLEDGE

- Efficiency
- Application
- Brakes
- Electric prime mover (motor types and control)
- Drum

T16 Electric lifts – mechanics encompassing:

- Governors Governor types including; vertical shaft, overspeed devices, horizontal shaft
- Governor operation testing and rope tension testing
- Safety gear Types; A instantaneous, B flexible guide clamp, C wedge clamp and D oil buffer
- Release procedures for each type of safety gear/governor combination
- Statutory requirements

T17 Maintenance, replacement and adjustment of mechanical lift components encompassing:

- Air cords
- Selectors
- Bearings; roller, sleeve, guide shoes, and slipper
- Door guides
- Landing doors
- Car doors
- Tapes/chains

T18 Brake types, function, operation, inspection and adjustment, circuitry, manual release and statutory requirements encompassing:

- Geared machine brakes
- Gearless machine brakes
- Brake function and statutory requirements
- Internal and external mechanical brakes
- Electrical operations including; stall motor, solenoid and hydraulic
- inspection and adjustment of mechanical and electrical brakes
- Brake circuitry
- Manual release devices and safe procedures
- Statutory requirements

T19 Electro-hydraulic lifts circuitry, controls and components encompassing:

- Electrical circuitry
- Pump motor, starter
- Governor switch
- Over travel limits
- Up, down solenoids

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REQUIRED SKILLS AND KNOWLEDGE

- Up, down limit switches
- Levelling switch
- Stop button
- Faulty components diagnosis
- Hydraulic components
- Hydraulic circuitry
- Servicing

T20 Electro-hydraulic lifts - mechanical operation – fluid power principles and components, operation, arrangements, lift code and other requirements and emergency passenger release encompassing:

- Fluids
- Hydraulics
- Pascal's Law
- Safety considerations of fluids under pressure
- Pump
- Control of hydraulic pressure
- Solenoid values
- Directional flow including pressure gauge
- Ram/cylinders, including single and multi stage
- Oil cooler
- Oil reservoir
- Filters
- Seals
- Bleeding lines
- General operation
- Types of arrangements including; side acting, direct and suspended
- Requirements of Lift Code/Standards including; viewing communication windows, labelling circuit breakers, head room/top of car, pump installation under car, anti-creep devices and closing of landing doors

T21 Emergency release procedures - trapped passengers – OHS considerations and communication with passengers encompassing:

- Enterprise requirements and procedures
- Passenger safety
- Moving under power
- Hand winding
- Determining numbers and condition of passengers
- Direction of lift travel before stopping
- Fault indication
- Status of doors
- Warnings about using controls

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REQUIRED SKILLS AND KNOWLEDGE

- Warnings about standing near doors
- Information related to impending movement
- Information relating to opening of doors
- Reassurance as to safety of passengers
- Emergency medical support

T22 Escalators and moving walks components encompassing:

- Machine Brakes
- Controller
- Safety devices
- Balustrade lighting
- Steps/pallets/belts
- Hand rail
- Drive chain
- Truss
- Track systems
- Step/pallet chains
- Rollers, Tension carriage
- Hand rail earthing

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment

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is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace

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procedures and practices including the use of risk control measures as specified in the performance criteria and range statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in lift systems as described as described in 8) and including:

A Governors.

B Brakes.

C Safety gear.

D Safety devices.

E Lift machines.

F Door components.

- Replace and/or adjustment of lift equipment in at least three types of lift equipment as described below

A Electro-hydraulic lift.

B Electric traction lift.

C Passenger lift.

D Goods lift.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in lifts systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency

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development in this unit may be arranged concurrently with unit:

UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to diagnosing and rectifying faults in lift circuits and associated components for at least three (3) types of lift circuits/components as listed:

- Governors
- Brakes
- Safety gear
- Safety devices
- Lift machines
- Door components
- Controllers
- Release passengers from a lift, which has become immobilised

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG118A Maintain operation of electrical mining equipment and systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers servicing of electrical systems and equipment in underground and open-cut mines. It encompasses working safely, applying knowledge of mining electrical systems and equipment, reading circuit and reticulation diagrams, applying logical fault diagnosis procedures, following fault rectification procedures and maintaining the necessary documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work and working in mines. Competencies in working in hazardous areas and with explosion-protected equipment are required where the workplace includes hazardous areas such as

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License to practice **3)**

underground coalmines.

Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Prerequisite Unit(s) **4)**

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to maintain operation of electrical mining equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The likely extent of work to be undertaken is envisaged from fault/breakdown reports and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Maintain operation of electrical mining equipment.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance

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ELEMENT	PERFORMANCE CRITERIA	
		OHS requirements and procedures.
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	2.5	Fault finding is approached methodically drawing on knowledge of mining electrical equipment and circuits using measured and calculated values of circuit/apparatus parameters.
	2.6	Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.7	Faulty circuits/components are rechecked and their fault status and acquired.
	2.8	Materials/replacement parts required to rectify faults are sourced and obtained in accordance with established procedures.
	2.9	Effectiveness of the repair is tested in accordance with established procedures.
	2.10	Apparatus is reassembled, finally tested and prepared for return to service.
	2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.12	Fault finding and repair activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete and report on maintaining operation of electrical mining equipment.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.

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ELEMENT	PERFORMANCE CRITERIA
	3.3 Maintenance work activities are documented in accordance with established procedures.

Note.
Examples of documentation are component faults reports, test results, authorisations, permits, and parts/component dispatch and stores records.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining operation of electrical mining equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG118A Electrical mining equipment and systems

Evidence shall show an understanding of maintaining the operation of mining equipment to an extent indicated by the following aspects:

T1 Technical standards, regulations and codes for mining encompassing:

- Regulation governing mining and related activities
- Standards and Codes that apply to mining electrical systems
  - Standards mandated under regulation or by an authority, deemed-to-comply standard and local service requirements.
  - Codes - applicable to electrical safe working practices
- Applying standards, regulations and codes to mining electrical systems encompassing:
- Protection for safety
- Installation arrangement
- Certified/approved electrical equipment
- Installation of electrical equipment
- Testing and verification

T2 Electrical mining systems overview encompassing:

- Mine reticulation
- Substations
- Transmission lines
- Switchgear
- Earthing

T3 Electrical control and protection in mines encompassing:

- Types of protection
- Operation of protection devices and systems
- Prospective fault currents
- Discrimination

T4 Mining cables encompassing:

- Handling
- Storage

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REQUIRED SKILLS AND KNOWLEDGE

- Testing

T5 Operation and safety of mining equipment encompassing:

- Battery charging
- Battery operated vehicles
- Conveyors
- Mine winder and package systems
- Ore extraction machinery
- Shuttle cars
- Ventilation fans

T6 Environmental monitoring and control encompassing:

- Basic principles
- Types and application of sensors
- Control methods

T7 Equipment monitoring methods

T8 Fire detection, warning and control systems

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the

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competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain operation of electrical mining equipment as described in 8) and including:

A Envisaging the likely extent of work from fault/breakdown reports and discussion with appropriate person(s).

B Using methodical fault finding techniques.

C Finding faults efficiently.

D Rectifying faults effectively.

E Completing documentation correctly.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment,

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conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining operation of electrical mining equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to maintaining operation of electrical mining equipment by rectifying any four of the following faults in mining equipment and circuits.

- Open-circuit
- Short-circuit
- Incorrect connections
- Insulation failure
- Unsafe condition
- Apparatus/component failure
- Related mechanical failure

Note:

1. Examples of apparatus are switchboards/distribution boards, protective devices such as circuit breakers, and earth leakage devices, control equipment, socket outlets, electric vehicles and motor starters and associated control devices.

2. Examples of circuits include those supplying fix equipment; lighting; motors; socket outlets; trailing cable and within electric vehicles.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG119A Maintain operation of electrical marine equipment and systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the servicing of electrical systems and equipment on vessels and ships. It encompasses working safely, applying knowledge of marine electrical systems and equipment, reading circuit and reticulation diagrams, applying logical fault diagnosis procedures, following fault rectification procedures and maintaining the necessary operational documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work and maritime regulations. Competencies in working in hazardous areas and with explosion-protected equipment are required where the workplace includes hazardous

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License to practice **3)**

areas such as in gain handling and fuel pumping facilities.

Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Prerequisite Unit(s) **4)**

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to maintain operation of electrical mining equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The likely extent of work to be undertaken is envisaged from fault/breakdown reports and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Maintain operation of electrical mining equipment.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance

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ELEMENT	PERFORMANCE CRITERIA	
		OHS requirements and procedures.
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	2.5	Fault finding is approached methodically drawing on knowledge of mining electrical equipment and circuits using measured and calculated values of circuit/apparatus parameters.
	2.6	Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.7	Faulty circuits/components are rechecked and their fault status and acquired.
	2.8	Materials/replacement parts required to rectify faults are sourced and obtained in accordance with established procedures.
	2.9	Effectiveness of the repair is tested in accordance with established procedures.
	2.10	Apparatus is reassembled, finally tested and prepared for return to service.
	2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.12	Fault finding and repair activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete and report on maintaining operation of electrical mining equipment.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.

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ELEMENT	PERFORMANCE CRITERIA
	3.3 Maintenance work activities are documented in accordance with established procedures.

Note.
Examples of documentation are component faults reports, test results, authorisations, permits, and parts/component dispatch and stores records.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining operation of electrical marine equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG119A Marine Electrical Systems

Evidence shall show an understanding of maintaining the operation of marine electrical equipment to an extent indicated by the following aspects:

T1 Cells and batteries in common use encompassing:

- Primary cells
- Secondary cells
- Discharging
- Recharging
- Terminal voltages
- Capacity
- Discharge and recharge characteristics
- Battery configurations and applications
- Cell and battery safety practices

T2 Marine electrical systems overview encompassing:

- Switchboards
- Instrumentation
- Earthing

T3 Alternators encompassing:

- Construction
- Characteristics
- Synchronised operation

T4 Switchboards and protection encompassing:

- Purpose
- Testing and maintenance
- Equipment removal

T5 Lighting systems purpose and types

T6 Power supplies encompassing:

- UPS systems
- Batteries

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REQUIRED SKILLS AND KNOWLEDGE

- Maintenance
- Safety procedures - battery banks

T7 Cathodic protection

- Purpose
- Operating parameters
- Corrosion factors

T8 Safety equipment and codes and regulations

T9 Electrical system commissioning requirements and surveys

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

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- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain operation of electrical marine equipment as described as described in 8) and including:

A Envisaging the likely extent of work from fault/breakdown reports and discussion with appropriate person(s).

B Using methodical fault finding techniques.

C Finding faults efficiently.

D Rectifying faults effectively.

E Completing documentation correctly.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in context of assessment, which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining operation of electrical marine equipment.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to maintaining operation of electrical marine equipment by rectifying any four of the following faults in marine equipment and circuits.

- Open-circuit
- Short-circuit
- Incorrect connections
- Insulation failure
- Unsafe condition
- Apparatus/component failure
- Related mechanical failure

Note:

1. Examples of apparatus are switchboards/distribution boards, protective devices such as circuit breakers, and earth leakage devices, control equipment, socket outlets, electric vehicles and motor starters and associated control devices.

2. Examples of circuits include those supplying fix equipment; lighting; motors; socket outlets; trailing cable and within electric vehicles.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG120A Select and arrange equipment for special LV electrical installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers selecting and arranging electrical equipment into distribution circuits for installations in caravan parks, construction and demolition sites, marinas, medical treatment areas and moveable premises operating at voltages up to 1,000V a.c. or 1,500 V d.c. The unit encompasses schemes for protection of persons and property, correct functioning, compatibility with the supply, arrangement of circuits and selection of switchgear, controlgear, protection devices and wiring based on calculated and deemed-to-comply solutions.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired and is therefore not applicable to those entering work.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of

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License to practice **3)**

training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

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Prerequisite Unit(s) **4)**

UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to select equipment.	1.1	The extent and nature of the electrical installation is determined from job specifications.
	1.2	Safety and other regulatory requirements to which the electrical installation shall comply are identified, obtained and understood.
2 Arrange installation into circuits.	2.1	Circuits are arranged to ensure safe and functional operation of the installation.
	2.2	Circuits are arranged to comply with technical standards and job specifications and requirements.
	2.3	Earthing is arranged to comply with the MEN system requirements.
3 Select cables, protection and switchgear.	3.1	Wiring is selected for suitability for the environments in which they are installed.
	3.2	Cable conductor sizes are selected to meet current-carrying capacity requirements and voltage-drop and fault-loop impedance limitations.
	3.3	Protection methods and devices are selected to meet co-ordination requirements for overload and short-circuit protection.
	3.4	Switchgear and control gear is selected to meet current, voltage and IP ratings and functional requirements.
	3.5	Earthing system components are selected to meet requirements of the MEN system.
	3.6	Evidence is obtained that electrical equipment selected complies with safety requirements.

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ELEMENT	PERFORMANCE CRITERIA	
4 Document electrical installation.	4.1	Reasons for selections made, including calculations, are documented in accordance with established procedures.
	4.2	Electrical installation arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and selecting and arranging equipment for special electrical installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG120A **Special electrical installations planning**

Evidence shall show an understanding of the selection and arrangement of equipment for special electrical installations to an extent indicated by the following aspects:

T1 Technical standards, regulations and codes for special electrical installations encompassing:

- Additional requirements for special installations
- caravan parks
- construction and demolition sites
- marinas
- medical treatment areas
- moveable premises
- HV installation in consumer’s premises

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Select and arrange equipment for special electrical installations as described as described in 8) and including:

A Arranging electrical installations to comply with safety and other regulatory and functional requirements.

B Selecting appropriate type and size of cables.

C Selecting protection methods and devices that meet co-ordination requirements for overload and short-circuit protection.

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D Selecting switchgear and control gear that meet current, voltage and IP ratings and functional requirements.

E Selecting appropriate earthing components.

F Documenting installation arrangement, specification for items selected and reasons for the selections made.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to selecting and arranging equipment for special electrical installations

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary

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equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED101A	Use computer applications relevant to a workplace
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by, selecting and arranging equipment for at least two of the following types of installations.

- Caravan parks,
- Construction and demolition sites.
- Marinas,
- Medical treatment areas,
- Moveable premises

The electrical installations shall comprise consumer’s mains, main earthing system and main switchboard and sub-mains, earthing system and distribution boards, final sub circuits and requirement particular to the installation type.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG121A Verify compliance and functionality of special LV electrical installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers testing and visual inspection for verifying that an electrical installation in caravan parks, construction and demolition sites, marinas, medical treatment areas, moveable premises installation in consumer's premises are safe and comply with requirements. The unit encompasses procedures for safely conducting mandatory and optional tests, conducting visual inspections, identifying non-compliance defects and mandatory reporting requirements.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safe and contracts of

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License to practice **3)**

training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work

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Prerequisite Unit(s)

4)

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits
UEENEEG120A	Select and arrange equipment for special LV electrical installations

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to inspect and test an electrical installation.	1.1	OHS measures for the site are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	Documentation or deemed to comply standard

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ELEMENT	PERFORMANCE CRITERIA	
		on which installation is based is reviewed and understood.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
	1.7	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2 Visually inspect the installation.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Wiring is checked for suitability for the environments in which they are installed and suitably protected from damage or overheating.
	2.5	Cable conductor sizes are acquired as meeting current-carrying capacity requirements and voltage-drop and fault-loop impedance limitations.
	2.6	Protection methods and devices are validated as meeting co-ordination requirements for overload and short-circuit protection.
	2.7	Switchgear and control gear is validated as being appropriately rated and meeting functional requirements.
	2.8	Evidence that electrical equipment complies with safety requirements is cited.

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ELEMENT	PERFORMANCE CRITERIA	
	2.9	Earthing system components are checked that they are correctly located and conductors correctly sized.
	2.10	Marking on switchboards are checked for accuracy and clarity and comply with requirements.
3 Conduct safety testing.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	3.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	3.4	Mandatory tests are conducted to verify that: Earthing conductor resistance is sufficiently low Insulation resistance is sufficiently high Polarities are correct Circuit connections are correct Other tests required by a Standard
	3.5	Testing is conducted to verify that: Fault-loop impedance is sufficiently low Residual current devices operate as intended.
4 Report inspection and test findings.	4.1	OHS risk control work completion measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.
	4.3	Non-compliance defects are identified and reported in accordance with established procedures.
	4.4	Recommendations for rectifying defects are made in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA
	4.5 Mandatory documentation is completed in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and verifying compliance and functionality of special electrical installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG121A Electrical installations, testing and verification of special installations

Evidence shall show an understanding of compliance and functionality verification of special electrical installations to an extent indicated by the following aspects:

T1 Technical standards, regulations and codes for special electrical installations encompassing:

- Additional requirements for special installations
- caravan parks
- construction and demolition sites
- marinas
- medical treatment areas
- moveable premises
- HV installation in consumer’s premises

T2 Mandatory and optional testing and verification requirements applicable to special installations encompassing:

- Testing techniques
- Features of special installations that can be visually inspected
- caravan parks
- construction and demolition sites
- marinas
- medical treatment areas
- moveable premises
- HV installation in consumer’s premises

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Verify compliance and functionality of special electrical installations as describe as described in 8) and including:

A Selecting correct tools and testing equipment.

B Identifying visual non-compliance defects.

C Using effective methods for conducting mandatory and optional tests.

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D	Identifying non-compliance from test results.
E	Identifying causes of non-compliance.
F	Completing mandatory reporting.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to verifying compliance and functionality of special electrical installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily

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intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by verifying compliance and functionality of at least two of the following types of installations

- Caravan parks
- Construction and demolition sites
- Marinas
- Medical treatment areas
- Moveable premises

The electrical installations shall comprise consumer's mains, main earthing system and main switchboard and sub-mains, earthing system and distribution boards, final sub circuits and requirement particular to the installation type.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG122A Conduct compliance inspection of single phase LV electrical installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers inspection of single phase domestic installations for demand not exceeding 100 A for varying compliance with electrical safety regulations. It encompasses working safely, conducting tests and inspections, documenting non-compliance defects, taking/recommending actions resulting from non-compliance defects, applying regulatory requirements and completing inspection reports.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safe and contracts of

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License to practice **3)**

training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work

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Prerequisite Unit(s)

4)

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct compliance inspection.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate person(s).
	1.4	Documentation or deemed to comply standard on which installation is based is reviewed and understood.

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Appropriate person(s) are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
2 Conduct compliance inspect.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Detailed inspection of the consumer's mains and main switchboard is conducted methodically to ascertain compliance of protection, metering, earthing, circuit arrangements and markings.
	2.5	Detailed inspection of circuits is conducted methodically to ascertain the compliance of the installed wiring, accessories, switchgear / control gear and current-using devices.
	2.6	Where deemed necessary, evidence that electrical equipment complies with safety requirements is sought from appropriate person(s) and sighted.
	2.7	Detailed inspection is conducted to verify compliance of earthing, insulation, polarity, circuit connections and operation of Residual current devices.
	2.8	Fault-loop impedance is ascertained as being sufficiently low by testing, calculation or deemed to comply with arrangement of the installation.
	2.9	Methods for dealing with unexpected situations

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ELEMENT	PERFORMANCE CRITERIA	
		are selected on the basis of safety and specified work outcomes.
3 Act and report on inspection findings.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Non-compliance defects are identified with appropriate clauses in regulatory standards and documented in accordance with established procedures.
	3.3	Actions are taken as a result of non-compliance within the scope of inspection responsibilities and authority and documented.
	3.4	Inspection report is made and issued to appropriate person(s) in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting compliance inspection of single phase electrical installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG122A Electrical installations, single phase inspections

Evidence shall show an understanding of conducting compliance inspections on single phase electrical installations to an extent indicated by the following aspects:

T1 Enterprise customer relations protocols encompassing:

- Purpose of customer relations
- Procedures for dealing with customers
- Dealing with customer issues

T2 Electricity regulatory safety requirements encompassing:

- Regulatory requirements for ensuring the safety and integrity of electrical installations.
  - Regulatory requirements are relative to the jurisdiction for which competency is sought
- Types and scope of electrical inspections and safety audits
- Authority of electrical inspectors

T3 Electrical installations, single phase inspections encompassing:

- Scope of inspection of single phase installations.
- Processes for inspection of single supply arrangements, main switchboard and earthing
- Actions and procedures for dealing with non-compliance defects.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct compliance inspection of single phase electrical installations as described as described in 8) and including:

A Obtaining appropriate documentation and equipment in preparation for the inspection.

B Conducting Detailed inspections and testing methodically.

C Identifying non-compliance defects.

D Relating non-compliance defects with appropriate clause in

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regulatory standards.

E Acting within the inspection authority when dealing with non-compliance defects.

F Documenting and reporting inspection findings.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting compliance inspection of single phase electrical installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate

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the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by conducting compliance inspection of at least two domestic electrical installations comprising a single phase, two wire supply with a maximum demand not exceeding 100 amperes containing, consumer's mains, main earthing system and those parts of a main switchboard related to the control of the installation and protection against spread of fire.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG123A Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers inspection of general electrical installations for verifying compliance with electrical safety regulations. It encompasses working safely, conducting tests and inspections, documenting non-compliance defects, taking/recommending actions resulting from non-compliance defects, applying regulatory requirements and completing inspection reports.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safe and contracts of

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License to practice **3)**

training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work

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Prerequisite Unit(s) **4)**

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct compliance inspection.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate person(s).

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Documentation or deemed to comply standard on which installation is based is reviewed and understood.
		1.5	Appropriate person(s) are consulted to ensure the work is coordinated effectively with others involved on the work site.
		1.6	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
2	Conduct compliance inspect.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Detailed inspection of the consumer’s mains and main switchboard is conducted methodically to ascertain compliance of protection, metering, earthing, circuit arrangements and markings.
		2.5	Detailed inspection of circuits is conducted methodically to ascertain the compliance of the installed wiring, accessories, switchgear / control gear and current-using devices.
		2.6	Where deemed necessary, evidence that electrical equipment complies with safety requirements is sought from appropriate person(s) and sighted.
		2.7	Detailed inspection is conducted to verify compliance of earthing, insulation, polarity, circuit connections and operation of Residual current devices.
		2.8	Fault-loop impedance is ascertained as being sufficiently low by testing, calculation or

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ELEMENT	PERFORMANCE CRITERIA	
		deemed to comply with arrangement of the installation.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Act and report on inspection findings.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Non-compliance defects are identified with appropriate clauses in regulatory standards and documented in accordance with established procedures.
	3.3	Actions are taken as a result of non-compliance within the scope of inspection responsibilities and authority and documented.
	3.4	Inspection report is made and issued to appropriate person(s) in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting compliance inspection of electrical installations with demand exceeding 100 A per phase.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG123A Electrical installations, inspections and safety compliance audits

Evidence shall show an understanding of conducting compliance testing of installations with demand of over 100 amperes per phase to an extent indicated by the following:

T1 Electrical installations, inspections and safety compliance audits encompassing:

- Inspection types and their scope.
- inspection of general electrical installations, special electrical installations, hazardous areas installations, safety audits and investigations.
- Inspection procedures
- Processes for confirming that performance standards have been met.
- Actions and procedures for dealing with non-compliance defect

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that

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can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated

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within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct compliance inspection of electrical installations with demand exceeding 100 A per phase as described in 8) and including:

A Obtaining appropriate documentation and equipment in preparation for the inspection.

B Conducting detailed inspections and testing methodically.

C Identifying non-compliance defects.

D Relating non-compliance defects with appropriate clause in regulatory standards.

E Acting within the inspection authority when dealing with non-compliance defects.

F Documenting and reporting inspection findings.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice

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using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting compliance inspection of electrical installations with demand exceeding 100 A per phase.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by conducting compliance inspection of at least two electrical installations comprising consumer's mains, main earthing system and main switchboard and sub-mains, earthing system and distribution boards related to the control of an individual occupier's portion of a multiple installation and final sub circuits.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG124A Conduct compliance inspection of special LV electrical installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers inspection of electrical installation in marinas, moveable premises and caravan parks, medical treatment centres, construction and demolition sites in consumer's premises for verifying compliance with electrical safety regulations. It encompasses working safely, conducting tests and inspections, documenting non-compliance defects, taking/recommending actions resulting from non-compliance defects, applying regulatory requirements and completing inspection reports.

Note:

Competency in verifying compliance of installations for hazardous areas is covered by "M" units:

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment

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Prerequisite Unit(s) **4)**

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits
UEENEEG120A	Select and arrange equipment for special LV electrical installations

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Prerequisite Unit(s) **4)**

UEENEEG121A	Verify compliance and functionality of special LV electrical installations
UEENEEG122A	Conduct compliance inspection of single phase LV electrical installations
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct compliance inspection.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate person(s).
	1.4	Documentation or deemed to comply standard on which installation is based is reviewed and understood.
	1.5	Appropriate person(s) are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
2 Conduct compliance inspect.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being

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		isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Detailed inspection of the consumer's mains and main switchboard is conducted methodically to ascertain compliance of protection, metering, earthing, circuit arrangements and markings.
	2.5	Detailed inspection of circuits is conducted methodically to ascertain the compliance of the installed wiring, accessories, switchgear / control gear and current-using devices.
	2.6	Where deemed necessary, evidence that electrical equipment complies with safety requirements is sought from appropriate person(s) and sighted.
	2.7	Detailed inspection is conducted to verify compliance of earthing, insulation, polarity, circuit connections and operation of Residual current devices.
	2.8	Fault-loop impedance is ascertained as being sufficiently low by testing, calculation or deemed to comply with arrangement of the installation.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Act and report on inspection findings.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Non-compliance defects are identified with appropriate clauses in regulatory standards and documented in accordance with established procedures.
	3.3	Actions are taken as a result of non-compliance within the scope of inspection responsibilities and authority and documented.
	3.4	Inspection report is made and issued to appropriate person(s) in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting compliance inspection of special electrical installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG124A **Inspection LV special electrical installations**

Evidence shall show an understanding of conducting compliance inspections of special electrical installations to an extent indicated by the following aspects:

T1 Technical standards, regulations and codes for special electrical installations encompassing:

- Additional requirements for special installations
- caravan parks
- construction and demolition sites
- marinas
- medical treatment areas
- moveable premises
- HV installation in consumer's premises

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment,

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such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

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- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct compliance inspection of special electrical installations as described in 8) and including:

A Obtaining appropriate documentation and equipment in preparation for the inspection.

B Conducting Detailed inspections and testing methodically.

C Identifying non-compliance defects.

D Relating non-compliance defects with appropriate clause in regulatory standards.

E Acting within the inspection authority when dealing with non-compliance defects.

F Documenting and reporting inspection findings.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice

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using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting compliance inspection of special electrical installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by conducting compliance inspection of at least three of the following types of installations.

- Caravan parks,
- Construction and demolition sites,
- Marinas,
- Medical treatment areas,
- Moveable premises

The electrical installations shall comprise consumers' mains, main earthing system and main switchboard and sub-mains, earthing system and distribution boards, final sub circuits and requirement particular to the installation type.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG125A Plan electrical installations with a low voltage demand up to 400 A per phase

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the planning of circuit and equipment for electrical installations where standardised arrangements for service and CT metering equipment are used, not exceeding 400 A per phase. This encompasses schemes for protection of persons and property, correct functioning, compatibility with the supply, arrangement of circuits, metering and control, cable route planning, specifying type and rating of switchgear, controlgear, protection devices and wiring based on calculated and deemed-to-comply solutions and planning documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106	Terminate cables, cords and accessories

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Prerequisite Unit(s) **4)**

A	for low voltage circuits
UEENEEG107 A	Select wiring systems and cables for low voltage general electrical installations

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to plan electrical installations.	1.1	OHS risk control measures and procedures for carrying out the work are followed.
	1.2	The extent and nature of the electrical installation is determined from job specifications.
	1.3	Safety and other regulatory requirements to which the electrical installation shall comply are identified, obtained and understood.
	1.4	Electricity tariffs required are discussed with appropriate person(s) to ascertain control and metering needs of the installation.
2 Arrange installation circuits, control and metering.	2.1	Circuits are arranged to ensure safe and functional operation of the installation.
	2.2	Circuits are arranged to comply with technical standards and job specifications and requirements.
	2.3	Control and metering of the installation is arranged in accordance with regulatory and local requirements and consumer needs.
	2.4	Earthing is arranged to comply with the standards and local energy supplier's requirements.
3 Specify cables, protection and switchgear.	3.1	Fault levels at each relevant point of the installation are determined from calculations and/or information from the local energy supplier's.
	3.2	Suitability of the wiring systems selected is determined to meet requirements for protection against environmental factors and job specifications.
	3.3	Cable conductor sizes are determined to meet current-carrying capacity requirements and voltage-drop and fault-loop impedance limitations and short circuit performance.

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ELEMENT	PERFORMANCE CRITERIA	
	3.4	Protection methods and devices are specified to meet co-ordination requirements for overload and short-circuit protection.
	3.5	Switchgear and control gear are specified to meet fault levels, current, voltage and IP ratings and functional requirements.
	3.6	Earthing system components are specified to meet requirements of the earthing system used.
	3.7	Evidence is obtained that electrical equipment selected complies with safety requirements.
4 Document electrical installation plan.	4.1	Equipment specified for the installation is documented together with supporting calculations in accordance with established procedures.
	4.2	Electrical installation arrangement, equipment locations, cable routes and schedules and requirements are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning electrical installations with a LV demand up to 400 A per phase.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG125A **Planning electrical installations – 400 A**

Evidence shall show an understanding of planning a low voltage electrical installation with demand of up to 400 amps per phase to an extent indicated by the following aspects:

T1 Electrical metering arrangements encompassing:

- Purpose, types and applications.
- Metering equipment.
- Arrangements for metering

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is

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recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan electrical installations with a LV demand up to 400 A per phase as described in 8) and including:

A Arranging electrical installations to comply with control, metering, safety and other regulatory and functional requirements.

B Specifying appropriate type and size of cables.

C Specifying protection methods and devices that meet co-ordination requirements for overload and short-circuit protection.

D Specifying switchgear and control gear that meet fault level, current, voltage and IP ratings and functional requirements.

E Selecting appropriate earthing system components.

F Documenting installation plan, specifications of equipment, equipment locations, cable routes and schedules and supporting calculations.

G Arranging electrical installations to comply with control, metering, safety and other regulatory and functional requirements.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to

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undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to planning electrical installations with a LV demand up to 400 A per phase.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 Use computer applications relevant to a workplace 1A

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to planning electrical installations with a LV demand up to 400 A per phase. The installation shall comprise a main switchboard CT metering, multiple tariffs or tenants, distribution boards single and three phase final sub circuits.

The electrical installations shall comprise consumers' mains, main earthing system and main switchboard and sub-mains, earthing system and distribution boards, final sub circuits and requirement particular to the installation type.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG126A Install and maintain field power and distribution systems with a low voltage demand up to 200 A per phase

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and maintenance of electrical field power and distribution systems intended to operate at voltages to 1,000 V a.c. or 1,500 V d.c. It encompasses working safely and to standards, positioning site generator sets, routing cables to specified locations, matching equipment with that specified for a given location terminating cables and connecting accessories and completing the necessary installation documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and maintain field power and distribution systems.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are

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ELEMENT	PERFORMANCE CRITERIA	
		followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Nature of the work and location of power equipment is determined by site inspection and from job instructions, specifications and/or diagrams.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Materials needed for the installation, maintenance/repair work are obtained in accordance with established procedures and checked against job requirements.
	1.7	Tools, equipment and testing devices needed to install or maintain/repair power supplies are obtained in accordance with established procedures and checked for correct operation and safety.
2 Install field power and distribution systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Generator set are located and installed to comply with technical standards and job specifications and requirements.
	2.3	Cable sets are selected to comply with load requirements and voltage drop limitations.
	2.4	Cable sets are installed terminated to comply with technical standards and job specifications and requirements.
	2.5	Tests are conducted to ensure installed power supply complies with specifications and functions as intended.
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.

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ELEMENT		PERFORMANCE CRITERIA	
		2.7	Installation of power supply is carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Maintain/repair field power and distribution systems.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Correct functioning of equipment is established from reference to manuals, system specifications and commissioning data.
		3.3	Faults are identified by reference to appropriate technical information and applying knowledge of field power and distribution systems to logical fault finding techniques.
		3.4	Faulty, worn, damaged or insecure components are replaced, repaired or secured in accordance with manufacturer's specifications and enterprise requirements.
		3.5	Tests are conducted to ensure maintained/repaired power and distribution system complies with specifications and functions as intended.
		3.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		3.7	Maintenance and repair of power and distribution system is carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
4	Complete installation and maintenance of field power and distribution systems.	4.1	OHS work completion risk control measures and procedures are followed.
		4.2	Work site is cleaned and made safe in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA
	4.3 Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining field power and distribution systems with a LV demand up to 200 A per phase.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG126A Field power and distribution systems

Evidence shall show an understanding of installing and maintaining field power and distribution systems with a low voltage demand up to 200 amps per phase to an extent indicated by the following aspects:

T1 Single phase alternators encompassing:

- Purpose, types and applications
- Operating principles and characteristics
- Installation and starting/running requirements and limitations
- Connection arrangements
- Typical fault symptoms and related conditions

T2 Three phase alternators encompassing:

- Purpose, types and applications
- Operating principles and characteristics
- Installation and starting/running requirements and limitations
- Connection arrangements
- Typical fault symptoms and related conditions

T3 Field power and distribution systems encompassing:

- Types applications and components
- Regulator and safety requirements and standard
- Equipment installation and commissioning
- Testing requirements

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain field power and distribution systems with a LV demand up to 200 A per phase as described in 8) and including:

A Interpreting specifications and circuit diagrams correctly.

B Maintaining, repairing and installing power and distribution systems correctly.

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C	Using appropriate diagnostic and fault finding techniques.
D	Following relevant codes of practice, procedures and requirements.
E	Completing relevant records and documentation.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and maintaining field power and distribution systems with a LV demand up to 200 A per phase.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Nil

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing and maintaining at least two field power and distribution systems with a LV demand up to 200 A per phase. The installation shall comprise a generator set, main switchboard, earthing system, at least one distribution board, flexible cable/plug sets, final sub circuits supplying lighting and power. One installation is to include a three phase load.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG127A Design electrical installations with a low voltage demand greater than 400 A per phase

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design of supply and distribution arrangements, control, protection and selection of equipment for electrical installations with low voltage demand greater than 400 amperes per phase. This encompasses designing schemes for protection of persons and property and correct functioning, compatibility with the supply, and arrangement of circuits, determination of fault levels, effective switchgear, control gear, and protection against over current and over and under voltage and wiring based on calculations to meet required safety and performance standards and functional requirements.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the work place. However

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit

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Prerequisite Unit(s) **4)**

UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to plan electrical installations.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent and nature of the electrical installation is determined from design brief.
	1.3	Safety and other regulatory requirements to which the electrical installation shall comply are identified, obtained and understood.
	1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the installation or associated work.
2 Develop installation design.	2.1	Knowledge of electrical installation performance standards, compliance methods and electrical equipment and is applied to designing the installation.
	2.2	Alternative arrangements for the installation design are considered based on the requirements outlined in the design brief.
	2.3	Safety, functional and budgetary considerations are incorporated in the installation design.
	2.4	Installation design draft is checked for compliance with the design brief and regulatory requirements.
	2.5	Installation design is documented for submission to appropriate person(s) for acceptance and approval.
	2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3 Obtain approval for installation design.	3.1	Installation design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the

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ELEMENT	PERFORMANCE CRITERIA
	constraints of organisation's policy.
	3.3 Final design is documented and approval obtained from appropriate person(s).
	3.4 Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing electrical installations with a LV demand greater than 400 A per phase.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG127A Electrical installations, advanced methods of cable and protection selection

Evidence shall show an understanding of designing low voltage electrical installations with a demand greater than 400 A per phase to an extent indicated by the following aspects:

T1 Electrical installations, determination of demand encompassing:

- Acceptable methods for determining demand in mains and submains
- Applying calculation and assessment methods of determining demand in mains and submains

T2 Electrical installations, overcurrent protection encompassing:

- Application of acceptable methods for determining prospective fault current.
- Relationship between prospective fault current and characteristics of protective devices.
- Relationship between overcurrent protections at various points in an electrical distribution system.

T3 Electrical installations, overvoltage and undervoltage protection encompassing:

- Application of acceptable methods for determining the need for overvoltage and undervoltage protection
- Methods and devices providing overvoltage and undervoltage protection

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design electrical installations with a LV demand greater than 400 A per phase as described in 8) and including:

A Developing outlines of alternative designs.

B Developing the design within the safety and functional requirements and budget limitations.

C Documenting and presenting design effectively.

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D	Successfully negotiating design alteration requests.
E	Obtaining approval for final design.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing electrical installations with a LV demand greater than 400 A per phase.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate

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the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 1A Use computer applications relevant to a workplace

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing electrical installations with a LV demand in excess of 400 A per phase. The installation shall comprise main switchboard, multiple tenancies, distribution boards and single and three-phase final sub circuits.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG128A Plan low voltage switchboard and control panel layouts

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers selecting and arranging equipment in electrical switchboards and control panels operating at voltages up to 1,000V a.c. or 1,500 V d.c. and fault levels not exceeding 20 kA. The unit encompasses arrangements for protection of persons and property, correct functioning, compatibility with the supply, and intended arrangement of circuits and selection of switchgear, controlgear and protection devices based on calculated and deemed-to-comply solutions and planning documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106	Terminate cables, cords and accessories

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Prerequisite Unit(s) **4)**

A	for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, 4Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to plan switchboard and control panel layouts.	1.1	OHS risk control measures and procedures for carrying out the work are followed.
	1.2	The extent and nature of the switchboard and control panel layouts is determined from job specifications or design brief.
	1.3	Safety and other regulatory requirements to which the switchboard and control panel layouts shall comply are identified, obtained and understood.
	1.4	Equipment to be incorporated in the switchboard or control panel is determined from job specifications or design brief.
2 Plan switchboard and control panel layouts.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Equipment is selected that complies with technical standards and job specifications and requirements.
	2.3	Switchboard and control panel layouts are planned to accommodate all necessary equipment with sufficient clearance to enable wiring/connecting and servicing with constraints imposed by job specifications.
	2.4	Switchboard and control panel layouts are planned to comply with safety regulatory and functional requirements.
	2.5	Switchboard and control panel layout draft is checked for compliance with the design brief and regulatory requirements.
	2.6	Switchboard and control panel layout is documented for submission to appropriate person(s) for acceptance and approval.
	2.7	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.

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ELEMENT	PERFORMANCE CRITERIA	
3 Obtain approval for switchboard and control panel layouts.	3.1	Requests for alterations to the layout are negotiated with relevant person(s) within the constraints of organisation's policy.
	3.2	Final layout design is documented and approval obtained from appropriate person(s).
	3.3	Switchboard and control panel layout documentation is forwarded to appropriate production personnel.
	3.4	Quality of work is monitored against established organisational standards

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning switchboard and control panel layouts.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies..

KS01-EG128A Switchboard/control panel planning

Evidence shall show an understanding of planning switchboard and control panel layouts to an extent indicated by the following aspects:

T1 Electrical metering arrangements encompassing:

- Purpose, types and applications.
- Metering equipment.
- Arrangements for metering

T2 Switchgear/controlgear encompassing:

- Types and applications
- Operating principles
- Interlocking systems
- Control and protection
- Installation requirements

T3 Control panel wiring encompassing:

- Equipment layout methods and accessories
- Connection identification methods
- Wiring techniques

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan switchboard and control panel layouts as described in 8) and including:

A Developing outlines of alternative layouts.

B Selecting equipment that complies with safety and functional requirements and budget limitations.

C Developing the layout within the safety and functional requirements and budget limitations.

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D Successfully negotiating layout alteration requests.

E Obtaining approval for final layout design.

F Documenting layout and equipment specifications clearly.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to planning switchboard and control panel layouts.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 1A Use computer applications relevant to a workplace

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to planning one switchboard layout and one control panel layout. The switchboard shall be in more than one section and comprise essential and general supply controls, CT metering, sub main controls, local distribution board and load monitoring and fault indication. The control panel shall consist of controls for more than two electrical machines, electro-mechanical and/or electronic control devices such as relays, timers, logic controllers, indicators and switches/push buttons.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG129A Overhaul and repair major switchgear and controlgear

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the overhauling and repairing switchgear/controlgear rated in excess of 20 kA. It requires the ability to establish and document the level of work required, arranging for the overhaul/repair to be carried out, verify compliance of overhauled/repaired switchgear/controlgear and complete the necessary documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and switchgear/control gear operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to

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License to practice **3)**

regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG111A	Carry out basic repairs to electrical components and equipment
UEENEEG164A	Repair and maintain mechanical components of electrical machines

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 4 Writing 4 Numeracy 4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for overhaul/repair of switchgear/control gear.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Instructions on the extent of overhaul and/or repair are received and expected outcomes of the work acquired with appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Switchgear/control gear service and repair documentation is read and understood.
	1.7	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.8	Tools, equipment and testing devices needed to work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Overhaul switchgear/control gear.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Switchgear and control gear is dismantled and parts tagged and stored to prevent loss or damage.
	2.5	The state of switchgear/control gear components is determined by measurements, tests and inspections and results recorded.
	2.6	Materials/replacement parts required to complete the work are sourced and obtained in accordance with established procedures.
	2.7	Effectiveness of the repairs is tested in accordance with established procedures.
	2.8	Specifications and instructions for the overhaul/repair work are documented in accordance with requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Document overhaul/repair work.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.
	3.3	Overhaul/repair work is documented in accordance with requirements stating that the switchgear/control gear complies with the overhaul specifications.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and overhauling and repairing major switchgear/controlgear.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG129A Switchgear and controlgear – 20 kA

Evidence shall show an understanding of the switchgear and controlgear to an extent indicated by the following aspects:

T1 Types and applications of switchgear and controlgear

T2 Operating principles of switchgear and controlgear

T3 Interlocking systems encompassing:

- external interlocking systems such as Castell Key systems
- internal interlocking systems for either safety or that operate in conjunction with say Castell Key systems

T4 Control and protection of switchgear and controlgear

T5 Installation requirements encompassing:

- operating specifications for equipment
- areas requiring repairs and maintenance
- determining if repairs/maintenance are to be carried in situ or in workshop environment
- relevant legislation and Standards applicable to the installation
- OHS issues with regard to removing/ re-installing heavy equipment
- electrical safety issues with regard to removing/ re-installing equipment
- understanding of CFC units

T6 Electrical switchgear and controlgear protection methods encompassing:

- understanding of the operation of switchgear when it opens under load
- understanding on the settings and operation required for both magnetic short-circuit and thermal overload with equipment
- determining the earth fault loop impedance requirements required to keep touch voltage values within requirements
- thermal imaging techniques
- time/current curves from manufacturers specifications
- equipment to safely test switchgear after repairs or maintenance
- effectiveness of arc suppression installed within the equipment
- modern types of switchgear that are computer controlled and programmed

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REQUIRED SKILLS AND KNOWLEDGE

- modern types of switchgear that are interconnected to other protective devices
- certification process for any repair or maintenance work performed
- phase-failure systems
- Verifying the correct fault-level for the installation is consistent with the kA rating of the equipment
- x-ray and ultrasonic detection systems with regard to metallurgy
- different types of lubricants required for different locations, temperatures and humidity

T7 Electrical safe working practices of working safely on or around electrical equipment encompassing:

- determining safe working Standards and codes of practice for equipment and installations over 20 kA
- OHS requirements for equipment and installations over 20 kA
- working knowledge of operating within the vicinity of live conductors, such as barriers
- procedures for working on switchgear over 20 kA
- risks and control measures associated with harmful dusts and airborne contaminants - sources include thermal insulation, fibrous cement materials and asbestos and other fibre reinforced switchboard materials
- checks and storage methods for maintaining the safety of testing devices

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for

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apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Overhaul and repair major switchgear/controlgear as described in 8) and including:

A	Interpreting service and repair documentation correctly.
B	Determining the state of switchgear/control gear correctly.
C	Repairing switchgear/control gear effectively.
D	Completing documentation correctly.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to overhauling and repairing major switchgear/controlgear.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency

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development in this unit may be arranged concurrently with unit:

UEENEEC001B	Maintain documentation
UEENEEC002B	Source and purchase material/parts for installation or service jobs

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to overhauling at least two types of low voltage switchgear/control gear rated above 20 kA and any high voltage switchgear/control gear.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG130A Design switchboards rated for high fault levels (greater than 400 A)

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design of supply and distribution arrangements, control, protection and selection of equipment for switchboards with low voltage demand greater than 400 amperes per phase. This encompasses designing schemes for protection of persons and property and correct functioning, compatibility with the supply, and arrangement of circuits, determination of fault levels, effective switchgear, control gear, and protection against over current, over and under voltage and wiring based on calculations to meet required safety and performance standards and functional requirements.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG128A	Plan low voltage switchboard and control panel layouts
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102	Solve problems in low voltage a.c. circuit

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Prerequisite Unit(s) **4)**

A

UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations

AND

UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems

AND

UEENEEE129A	Solve electrotechnical engineering problems

OR

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits

OR

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

AND

UEENEEE104	Solve problems in d.c. circuits

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Prerequisite Unit(s) **4)**

A

OR

UEENEEH169 Solve problems in basic electronic circuits A

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design switchboards.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent and nature of the switchboard is determined from design brief.
	1.3	Safety and other regulatory requirements to which the switchboard shall comply are identified, obtained and understood.
	1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the installation or associated work.
2 Develop installation design.	2.1	Knowledge of switchboard performance standards, compliance methods and electrical equipment and is applied to designing the installation.
	2.2	Alternative arrangements for the switchboard design are considered based on the requirements outlined in the design brief.
	2.3	Safety, functional and budgetary considerations are incorporated in the installation design.
	2.4	Switchboard design draft is checked for compliance with the design brief and regulatory requirements.
	2.5	Switchboard design is documented for submission to appropriate person(s) for acceptance and approval.
	2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3 Obtain approval for installation design.	3.1	Switchboard design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the

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ELEMENT	PERFORMANCE CRITERIA	
		constraints of organisation's policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing switchboards rated for high fault levels.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG130A Switchboard design

Evidence shall show an understanding of the design of low voltage switchboards rated for high fault currents to an extent indicated by the following aspects:

T1 Trade calculations encompassing:

- mathematical techniques
- relevant calculations
- linear measurement, areas, volumes, ratios

T2 Engineering mechanics encompassing:

- base physical quantities
- concepts, principles, S.I. units, their applications in
- engineering calculations in relation to physical quantities and
- associated formulae
- mass, velocity, acceleration, force, weight, density, angles
- energy/work/power
- moments/torque
- centre of gravity
- mechanical advantage
- levers
- pulley blocks
- efficiency
- friction
- vectors
- resolution of forces
- forces in strung conductors
- forces on poles and towers
- determination of sag
- pressure/stress
- elementary fluid mechanics

T3 Engineering materials encompassing:

- classification
- ferrous and non-ferrous metals

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REQUIRED SKILLS AND KNOWLEDGE

- steels, alloys,
- properties
- tensile strength
- temperature and expansion in metals
- stress and strain
- ductility
- applications
- corrosion
- galvanic corrosion
- hardwoods and soft woods

T4 Fault current calculations encompassing:

- Calculation of fault currents
- Calculation/Determination of positive, negative and zero sequence impedances
- Determination of fault current breaking and let-through energy capacities of protection devices
- The influence of fault/arc impedances
- Impedances operative for phase-to-phase and phase-to-earth faults
- Calculation of fault currents for phase-to-phase and phase-to-earth faults
- Approximation calculations by selecting the components with the major impedance

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment

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intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design switchboards rated for high fault levels as described in 8) and including:

A Developing outlines of alternative designs.

B Developing the design within the safety and functional requirements and budget limitations.

C Documenting and presenting design effectively.

D Successfully negotiating design alteration requests.

E Obtaining approval for final design.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing switchboards rated for high fault levels.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED104A	Use engineering applications software on personal computers

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing switchboards rated for fault levels in excess of 20 kA. The switchboard shall comprise control for essential and general supply, metering, sub-main controls, local final sub-circuit distribution board and fault monitoring.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG131A Evaluate performance of low voltage electrical apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers testing of electrical apparatus for compliance with a standard and regulation for the purpose of certification, approval and/or product quality maintenance. The unit encompasses safe working practices, determining performance requirements, inspecting, setting up performance tests, evaluating inspection and test results and documenting test outcomes.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as

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License to practice **3)**

apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’.

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to evaluate electrical apparatus	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Examination and testing area is checked for safety hazards and risk control measures implemented in strict accordance with safety policy and procedures.
	1.4	Relevant documentation is obtained and read to determine the certification/approval specifications for which the equipment is to be assessed. Note: Examples of documentation are those specifying safety requirements, technical standard, as marketed technical performance

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ELEMENT	PERFORMANCE CRITERIA	
		and product quality endorsement standards.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2 Evaluate electrical apparatus	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/apparatus/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	In depth knowledge of the performance requirements of electrical apparatus and testing methods are applied to the assessment process.
	2.5	Apparatus examination and tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
	2.6	Apparatus examination and tests are carried out methodically and results and comments systematically noted.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Assessment is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and document evaluate results	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Examination and test results are evaluated and non-compliance issues identified.
	3.4	Examination, test results and comments on non-compliance issues are documented and reported to appropriate person(s) in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and evaluating performance of electrical apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG131A Performance standards and regulatory requirement for electrical equipment

Evidence shall show an understanding of evaluating the performance of electrical apparatus to an extent indicated by the following aspects:

T1. Performance standards and regulatory requirements for electrical equipment encompassing:

- Standards philosophy and format
- How to read and apply a standard
- Performance standards requirements and machine efficiency
- Regulations

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Evaluate performance of electrical apparatus as described in 8) and including:

A Interpreting compliance documents.

B Setting up and conducting appropriate examinations and tests.

C Identifying non-compliance issues.

D Reporting examination and test results and non-compliance

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issues clearly and accurately.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to evaluating performance of electrical apparatus.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to at least two different current-using apparatus and two different control apparatus.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG132A Carry out low voltage electrical field testing and report findings

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers field testing of electrical systems, circuits and apparatus to determine the cause of faults, malfunctions or compliance. It encompasses working safely and to standards, applying knowledge of electrical measurement and testing, following appropriate test procedures, documenting, evaluating and reporting test results.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as

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License to practice **3)**

apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work

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Prerequisite Unit(s) **4)**

UEENEEG006 A	Solve problems in single and three phase low voltage machines
UEENEEG033 A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063 A	Arrange circuits, control and protection for general electrical installations
UEENEEG101 A	Solve problems in electromagnetic devices and related circuits
UEENEEG102 A	Solve problems in low voltage a.c. circuit
UEENEEG103 A	Install low voltage wiring and accessories
UEENEEG104 A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG105 A	Verify compliance and functionality of low voltage general electrical installations
UEENEEG106 A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107 A	A Select wiring systems and cables for low voltage general electrical installations
UEENEEG108 A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109 A	Develop and connect electrical control circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each

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scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to carry out electrical field testing.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The likely extent of work to be undertaken is envisaged from situation reports and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Carry out electrical field testing.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	2.5	Field testing and measuring is approached methodically drawing on knowledge of electrical systems, circuits, apparatus and testing/measuring techniques appropriate to each test and situation.
	2.6	Circuit apparatus/components are dismantled where necessary to facilitate testing and parts stored to protect them against loss or damage.
	2.7	Tests required are determined from situation report and appropriate testing/measuring instruments selected and set up in accordance with manufacturer's instructions and industry standards.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.9	Testing activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete electrical field testing and report findings.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Apparatus is reassembled after testing where necessary, and work area is cleaned and made safe in accordance with established procedures.
	3.3	Test findings are reported including recommendation for any action to be taken to rectify/modify conditions or parameters shown by the tests.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out electrical field testing and report findings.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG132A Electrical field testing and measurement techniques

Evidence shall show an understanding of carrying out electrical field testing and reporting findings to an extent indicated by the following aspects:

T1 Advance electrical testing and measuring devices encompassing:

- Test/measuring devices and their application
- Circuit arrangement and safety procedures for connection of testing/measuring devices into a circuit
- Taking readings
- Storage, maintenance and care of test/measuring devices

T2 Measurement concepts encompassing:

- notion of error, accuracy, resolution
- sources of measurement error and uncertainties
- instrument specifications and calibration certificates
- test and measuring instrument safety certification levels and their application

T3 Types of field measuring instruments and their application encompassing:

- instrument meter movements and readouts

  Note

  These include moving coil, moving iron and dynamometer meter movements, LCD digital and screen readouts.
- Role of a microprocessor/controller in measuring instrument

T4 Measuring low voltages and direct and alternating currents encompassing:

- low voltage and current measurement techniques embodied in microprocessor based instruments.
- causes of inaccuracies and overcoming them.
- test instrument set up and safety procedures
- interpreting test readings

T5 Measuring high voltages and direct and alternating currents encompassing:

- high voltage and current measurement techniques embodied in microprocessor based instruments

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REQUIRED SKILLS AND KNOWLEDGE

- causes of inaccuracies and overcoming them
- test instrument set up and safety procedures
- interpreting test readings

T6 Measuring fault levels and (earth) fault loop impedance encompassing:

- fault and fault loop impedance measurement techniques embodied in microprocessor based instruments
- causes of inaccuracies and overcoming them
- test instrument set up and safety procedures
- interpreting test readings

T7 Measuring power, energy, reactive power, power factor and maximum demand encompassing:

- power measurement techniques embodied in microprocessor based instruments.
- causes of inaccuracies and overcoming them.
- test instrument set up and safety procedures
- interpreting test readings

T8 Measuring power quality encompassing:

- power measurement techniques embodied in microprocessor based instruments.
- causes of inaccuracies and overcoming them.
- test instrument set up and safety procedures
- interpreting test readings.

Note.

Power quality measurement includes waveform distortion, harmonics, power factor and transients.

T9 Power cable faults and fault detection techniques encompassing:

- poor connection (high resistance
- open-circuit
- insulation breakdown and arcing.
- b) Varley and Murray loop tests
- Pulse test
- Echo test
- Radio based tests

T10 Application and limitations of the various cable fault detection techniques encompassing:

- cable fault detection techniques embodied in microprocessor based instruments.
- causes of inaccuracies and overcoming them.
- test instrument set up and safety procedures
- interpreting test readings.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out electrical field testing and report findings as described in 8) and including:

A Envisaging the extent of work from situation reports and discussion with appropriate person(s).

B Using methodical testing techniques appropriate to each type of test and situation.

C Selecting and setting up appropriate

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	testing/measuring instruments in accordance with manufacturer's instructions and industry standards.
D	Writing test findings and recommendations of actions to be taken.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

The resources used for assessment should reflect current industry practices in relation to carrying out electrical field testing and report findings.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

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Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out and reporting findings of electrical field tests for the purpose of:

Locating faults

Examining operating parameters

Accessing compliance with regulations

Evaluating quality compliance

Note.

Examples of tests are earth system testing including HV installations; Varley loop testing; earth resistance measurements in electro-medical areas; temperature rise and thermography; circuit breaker residual current testing; illumination measurements and interpretation; industrial power factor measurements; radiation leakage in microwave ovens; antennae field strength measurement

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG143A Develop engineering solution for synchronous machine and control problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers developing engineering solutions to resolve problems with synchronous machines and their controls. It encompasses working safely, apply extensive knowledge of synchronous machine operation, construction and their application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical machine problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 6

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace for work involving

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License to practice **3)**

direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems

AND

UEENEEE1	Solve electrotechnical engineering

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Prerequisite Unit(s)

4)

29A	problems
OR	
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
OR	
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
AND	
UEENEEE104A	Solve problems in d.c. circuits
OR	
UEENEEH169A	Solve problems in basic electronic circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop engineering solution for synchronous machine problems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the machine problem is determined from performance specifications and situation reports and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop engineering solution for synchronous machine problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of synchronous machine construction, operation, characteristics and applications are applied to developing solutions to synchronous machine problems.
	2.3	Parameters, specifications and performance requirements in relation to each machine problem are obtained in accordance with established procedures.
	2.4	Approaches to resolving synchronous machine problems are analysed to provide most effective solutions.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test, document and implement engineering solution for synchronous machine problem.	3.1	Solutions to machine problems are tested to determine their effectiveness and modified where necessary.
	3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.
	3.3	Appropriately competent and qualified person(s) required to implement solutions to synchronous machine problems are coordinated in accordance with regulatory requirements and enterprise policy. (Note)
	3.4	Justification for solutions used to solve synchronous machine problems is documented for inclusion in work/project development records in accordance with professional standards.

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ELEMENT	PERFORMANCE CRITERIA
	Note: A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing engineering solution for synchronous machine problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG143A Synchronous machine diagnostics

Evidence shall show an understanding of developing engineering solutions for synchronous machine problems to an extent indicated by the following aspects:

T1 a.c. generators – construction, types and cooling encompassing:

- construction of stator and rotor windings
- rotor construction (cylindrical and salient pole)
- advantages of rotating field construction
- excitation methods
- cooling methods
- prime movers

T2 a.c. generators – operating principles and characteristics encompassing:

- a.c. generator equivalent circuits (synchronous reactance and resistance components)
- tests – open circuit, short circuit, stator impedance
- voltage regulation, island generator's terminal voltage load power factor
- determination of excitation voltage and load angle

T3 Synchronising a.c. generators encompassing:

- conditions for synchronising (infinite bus)
- methods for synchronising (lamp methods, synchroscope)
- alternator load sharing, parallel operation

T4 a.c. generators power, torque and efficiency encompassing:

- power input, input torque, speed
- power losses
- output power, load power factor, rotor angle, pu power
- efficiency
- performance chart interpretation

T5 Voltage regulation (AVR) encompassing:

- need for AVR's
- features of AVR's
- effects of rotor inductance

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REQUIRED SKILLS AND KNOWLEDGE

- connections of AVRs
- operation of AVRs

T6 a.c. generator operational stability encompassing:

- power output, VAR effects, rotor angle, excitation
- control of VAR (OLTC transformers)
- voltage dependant nature of stability
- critical clearance angle of a.c. generator
- stability limits

T7 a.c. generator protection encompassing:

- restricted, unrestricted primary, back up and duplicated protection
- overcurrent, short circuit, differential, reverse power, load unbalance, rotor overload, loss-of-field, rotor earth fault, station earth fault, under frequency protection
- external fault protection

T8 Induction generator encompassing:

- types operating principles, characteristics
- excitation methods
- losses and efficiency
- synchronising and paralleling

T9 Three phase synchronous motors encompassing:

- construction – rotor, stator, windings
- excitation methods
- operating principles (equivalent circuits, synchronous impedance)
- hunting and stability limits
- power factor correction
- paralleling and synchronisation techniques
- starting methods
- braking methods

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop engineering solution for synchronous machine problems as described in 8) and including:

A Understanding the extent of the machine problem.

B Forming effective strategies for solution development and implementation.

C Obtaining machine parameters, specifications and performance requirements appropriate to each

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problem.

D Testing and solutions to machine problems.

E Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.

F Documenting justification of solutions implemented in accordance with professional standards.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing engineering solution for

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synchronous machine problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) 8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing engineering solution for at least four synchronous machine problems.

Note.

Typical machine problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG144A Develop engineering solutions for d.c. machine and control problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing engineering solutions to resolve problems with d.c. machines and their controls. It encompasses working safely; apply extensive knowledge of d.c machine operation and construction and their application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical machine problems are those encountered in meeting performance requirements and compliance standards, revising machine operating parameters and dealing with machine malfunctions.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 6

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace for work involving

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License to practice **3)**

direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems

AND

UEENEEE129A	Solve electrotechnical engineering problems

OR

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Prerequisite Unit(s)

4)

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits

OR

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

AND

UEENEEE104A	Solve problems in d.c. circuits

OR

UEENEEH169A	Solve problems in basic electronic circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop engineering solution for d.c. machine problems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the machine problem is determined from performance specifications and situation reports and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop engineering solution for d.c. machine problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of d.c machine construction, operation, characteristics and applications are applied to developing solutions to d.c machine problems.
	2.3	Parameters, specifications and performance requirements in relation to each machine problem are obtained in accordance with established procedures.
	2.4	Approaches to resolving d.c. machine problems are analysed to provide most effective solutions.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test, document and implement engineering solution for d.c. machine problems.	3.1	Solutions to machine problems are tested to determine their effectiveness and modified where necessary.
	3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.
	3.3	Appropriately competent and qualified person(s) required to implement solutions to d.c machine problems are coordinated in accordance with regulatory requirements and enterprise policy. (Note)
	3.4	Justification for solutions used to solve d.c. machine problems is documented for inclusion in work/project development records in accordance with professional standards.

Note:

A license to practice in the workplace is required for work involving

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ELEMENT	PERFORMANCE CRITERIA
	direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing engineering solutions for d.c. machine problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG144A Direct current machine diagnostics

Evidence shall show an understanding of developing engineering solutions for d.c. machine problems to an extent indicated by the following aspects:

T1 Basic d.c. machine construction and operation encompassing:

- General principles of operation
- Applications of d.c. machines
- Construction of d.c. machines
- d.c. machine configurations; series, shunt, compound long shunt and compound short shunt
- Armature and field currents
- Insulation
- Ratings
- Cooling paths
- Bearings
- General maintenance of d.c. machines

T2 Construction and use of lap and wave windings encompassing:

- coils and elements
- generated voltage equation for generator
- generated voltage equation for motors
- application of lap and wave windings

T3 Commutation process encompassing:

- use of interpoles
- loading of machines
- brush shifting
- brush selection
- classes of brush grades

  Note:

  Examples include: natural graphite, hard carbon, electrographite, metal-graphite, metal-carbon, “treated” grades
- carbon brush contact characteristics

  Note:

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REQUIRED SKILLS AND KNOWLEDGE

Examples include: specific resistance, thermal conductivity, density and porosity, elastic properties, contact properties

- carbon brush factors

  Note:

  Examples are: pressure, current, polarity, speed
- brush construction

  Note:

  Examples are: dimensions, tolerances, preferred sizes, surfaces, edges, bevels, flexible shunts, connection of flexible shunt to brush, insulation of flexible connections
- brush holders

  Note:

  Examples are: types, brush angles, trailing holders, reaction holders, top bevel angles, reversible rotation, cantilever holders, effective arc of contact, construction of brush holders, pressure mechanism
- mounting of brush holders and brushes

  Note:

  Examples are: clearances, brush angle, brush arm spacing, alignment, staggering, brush bedding, brush pressure
- brush operation

  Note:

  Examples are: temperature rise, number and size of brushes, current distribution etween brushes, slotting brushes, polarity effects, arc of contact, materials for commutators, mica
- selection of brush grades

  Note:

  Examples are: machine data, current density, commutator peripheral speed, brush arc, pitch of segments, number of segments covered by brush, cooling surface

T4 Armature reaction in d.c. machines encompassing:

- effect of armature reaction on d.c. machine characteristics
- use of compensating winding

T5 d.c. generators encompassing:

- relative advantages and disadvantages of the various dc generator configurations and their performance under various load conditions
- voltage regulation as a percentage or per unit value
- operation in parallel

T6 d.c. motors encompassing:

- relative advantages and disadvantages of the various dc motor configurations and their performance under various load conditions

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REQUIRED SKILLS AND KNOWLEDGE

- shape of motor speed/torque curves
- reversal of rotation

T7 Starting and protection of d.c. motors encompassing:

- types of d.c. motor starters in use
- d.c. motor protection

T8 Speed regulation and speed control of d.c. motors encompassing:

- methods in use
- effect on motor design and operation caused by the use of SCR
- speed control equipment

T9 Braking of d.c. motors encompassing:

- Plugging
- Dynamic
- Regenerative
- Mechanical

T10 Losses, heating and efficiency encompassing:

- Copper losses
- Iron losses
- Mechanical losses
- Efficiency

T11 Acceleration of d.c. motors and loads encompassing:

- characteristics of typical loads
- matching a suitable motor to a given load
- heating of windings
- derating of motors

T12 Special d.c. motors construction, operation and applications encompassing:

- permanent-magnet motors
- brushless motors (e.c. motors)
- coreless and moving coil motors
- linear motors
- printed circuit motor
- stepping motors
- voice-coil motors

T13 Maintenance of d.c. machines encompassing:

- routine maintenance
- breakdown repairs

T14 types of faults encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- brushes/brush gear problems

  Note:

  Examples are: sparking, excessive heating, excessive wear of brushes, commutator or slip rings, bad surface conditions, excessive maintenance, flexible burning, flexible corrosion, separation or grooving, blackening, copper picking, copper dragging, brush noise

T15 adjustment of machines encompassing:

- correct brush position
- machining and finishing of commutators

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

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- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop engineering solutions for d.c. machine problems as described in 8) and including:

A Understanding the extent of the machine problem.

B Forming effective strategies for solution development and implementation.

C Obtaining machine parameters, specifications and performance requirements appropriate to each problem.

D Testing and solutions to machine problems.

E Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.

F Documenting justification of solutions implemented in accordance with professional standards.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing engineering solutions for d.c. machine problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing engineering solution for at least four d.c. machine problems.

Note.

Typical machine problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG145A Develop engineering solutions for induction machine and control problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing engineering solutions to resolve problems with induction machines and their controls. It encompasses working safely; apply extensive knowledge of induction machine operation and construction and their application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical motor problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 6

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace for work involving

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License to practice **3)**

direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems

AND

UEENEEE1	Solve electrotechnical engineering

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Prerequisite Unit(s)

4)

29A	problems
OR	
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
OR	
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
AND	
UEENEEE104A	Solve problems in d.c. circuits
OR	
UEENEEH169A	Solve problems in basic electronic circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills	**5)**
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop engineering solution for induction machine problems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the machine problem is determined from performance specifications and situation reports and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop engineering solution for induction machine problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of induction machine construction, operation, characteristics and applications are applied to developing solutions to induction machine problems.
	2.3	Parameters, specifications and performance requirements in relation to each machine problem are obtained in accordance with established procedures.
	2.4	Approaches to resolving induction machine problems are analysed to provide most effective solutions.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test, document and implement engineering solution for induction machine problems.	3.1	Solutions to machine problems are tested to determine their effectiveness and modified where necessary.
	3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.
	3.3	Appropriately competent and qualified person(s) required to implement solutions to induction machine problems are coordinated in accordance with regulatory requirements and enterprise policy. (Note)
	3.4	Justification for solutions used to solve induction machine problems is documented for inclusion in work/project development records in accordance with professional standards.

Note:

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ELEMENT	PERFORMANCE CRITERIA
	A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing engineering solutions for induction machines and their control problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG145A Induction machines diagnostics

Evidence shall show an understanding of developing engineering solutions for induction motor problems to an extent indicated by the following aspects:

T1 Operating principles of polyphase induction motors encompassing:

- rotating magnetic field torque slip
- MMF relationships
- Leakage fluxes

T2 Construction of polyphase induction motors encompassing:

- squirrel cage motors
- slip-ring motors
- construction considerations in minimisation of tooth locking

T3 Speed-torque relationships in induction motors encompassing:

- maximum torque
- torque – slip relationships
- squirrel cage rotor types
- power flow in the motors
- power distribution
- torque units
- slip ring rotors

T4 Induction motor performance testing encompassing:

- no-load tests
- locked rotor tests
- development of motor equivalent circuit from test results
- analysis of motor performance using circle diagrams

T5 Induction motor starters encompassing:

- starting requirements
- type of starters
- starting torque
- starting dynamics
- static friction

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REQUIRED SKILLS AND KNOWLEDGE

- mechanical loads
- starting duration

T6 Reduced voltage starting encompassing:

- starting dynamics
- change over conditions
- starting duration
- acceleration curves

T7 Speed control of induction motors encompassing:

- constant torque, constant power concepts
- torque-flux-voltage relationships
- rotor resistance control
- stator impedance control
- variable frequency control (e.g. PAM, PWM, Flux vector control)

T8 Braking of induction motors encompassing:

- electrical braking systems (plugging, d.c. dynamic, regenerative, capacitor-magnetic)
- mechanical braking systems (mechanical drum, demag, eddy current)

T9 Motor protection encompassing:

- overload
- earth fault
- phase failure

T10 Motor selection criteria and RMS rating

T11 Induction motor maintenance/repair encompassing:

- routine maintenance schedules
- type of repairs (mechanical, electrical)

T12 Single phase induction motors encompassing:

- operating principles (especially RMF)
- construction types
- speed-torque relationships
- testing

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop engineering solutions for induction machine problems as described in 8) and including:

A Understanding the extent of the machine problem.

B Forming effective strategies for solution development and implementation.

C Obtaining machine parameters, specifications and performance requirements appropriate to each

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	problem.
D	Testing and solutions to machine problems
E	Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.
F	Documenting justification of solutions implemented in accordance with professional standards.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing engineering solutions for

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induction machine problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing engineering solution for at least two types of induction machine problems.

Note.

Typical machine problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG149A Provide engineering solutions to problems in complex polyphase power circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers determining correct operation of complex polyphase power circuits and providing solutions as they apply to electrical power engineering work functions. It encompasses working safely, problem solving procedures, including using electrical measuring devices, applying appropriate circuit theorems and providing solutions derived from measurements and calculations and justification for such solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits

and

UEENEEG102A	Solve problems in low voltage a.c. circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide engineering solutions to problems in complex polyphase power circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct

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ELEMENT	PERFORMANCE CRITERIA	
		operation and safety.
2 Provide engineering solutions to problems in complex polyphase \ power circuits.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used for solving circuit problems from measure and calculated values as they apply to complex polyphase power circuits.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document solutions for problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing solutions for problems in complex polyphase power circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG149A Polyphase power circuit analysis

Evidence shall show an understanding of polyphase power circuit analysis to an extent indicated by the following aspects:

T1 Polyphase supply system encompassing:

- advantage of three phase system compared to single phase systems
- double subscript notation
- phase sequence
- 120 degree operator
- given circuit component parameters, solve practically based problems using:
- equivalent circuits of transformers, lines and loads.
- component values using rectangular and polar notation.
- current divider and potential divider rules using complex impedances.
- The “per unit” values of voltage, current, VA and impedance to a common VA base.

T2 Types of three phase system connections encompassing:

- supply to balanced star, 3 and 4 wire loads
- supply to delta connected loads
- effects of phase reversal
- representation of currents and voltages as complex phasors for 3 phase and 3 phase and neutral quantities.
- calculation the values of and draw labeled phasor diagrams, not to scale, to represent complex values of current and voltage for balanced and unbalanced loads for star and delta systems.
- calculation of values of P, Q and S for balanced and unbalanced systems.
- draw and label single phase diagrams to represent 1 phase of a complex 3 phase system.
- represent unbalanced voltages or currents as symmetrical components.
- Phase to phase currents
- Phase to neutral/earth currents.

T3 Balanced three phase loads encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- calculations of balanced loads connected in star
- calculations of balanced loads connected in delta
- calculation of steady state values of fault current for various configurations.
- evaluation of the symmetrical component impedances for the various distribution system components. Transformers (earthed neutral case). Generators (high impedance earth)
- calculation of fault currents using the per unit approach.
- calculation using the "worst case" values based on transformer impedance only (ie., a short circuit fault)
- estimation of peak values using accepted multipliers.
- effects of the d.c. component on the instantaneous magnitudes of fault currents in transformers and generators.

T4 Unbalanced three phase loads encompassing:

- Star – 4 wire systems
- Delta systems
- Star – 3 wire systems
- Star 4 wire with neutral impedance

T5 Power in three-phase circuits encompassing:

- summation of phase powers and power in balanced loads
- measurement of power in balanced loads – 2 Wattmeter methods

T6 Reactive three phase power encompassing:

- power triangle calculation
- measurement of VAR
- power factor correction

T7 Fault currents encompassing:

- symmetrical components
- positive, negative and zero sequence impedance
- fault current breaking and let-through energy capacities of circuit breakers, fuses
- importance of fault/arc impedance
- calculation of fault currents - phase-to-earth faults
- calculation of fault currents - phase-to-phase faults
- analysis of asymmetrical faults currents.

T8 Harmonics in three phase systems encompassing:

- presence of triple in harmonics in 3 phase systems
- effects of 3 phase harmonics for different star and delta connections.
- methods for reducing harmonics in three phase systems.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

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EVIDENCE GUIDE

competency in this unit

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in complex polyphase power circuits as described in 8) and including:

    A Determining the operating parameters of existing circuit.

    B Using established problem solving methods.

    C Taking relevant measurements accurately.

    D Interpreting measured values appropriately.

    E Providing effective solutions to circuit problems from measurements and calculations.

    F Giving written justification of solutions provided.

    G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above

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EVIDENCE GUIDE

listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing engineering solutions for solving problems in complex polyphase power circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to providing engineering solutions to complex polyphase power circuits as they apply to problems related to electrical power engineering diagnosis and development work functions in any of the following types of circuit problems:

- Determining the operating parameters of an existing complex circuit
- Altering an existing complex circuit to comply with specified operating parameters
- Developing complex circuits to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Electrical

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UEENEEG150A Wind electrical coils

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers setting up coil former and winding machines and winding coils for static and rotating electrical machines. It encompasses working safely, using hand and powered tools, measuring, applying basic knowledge of electrical circuits, following technical instructions and set procedures and recording work activities.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to wind coils.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	Work instructions are identified, obtained and understood.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Materials required for the work are obtained in accordance with established routines and procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Wind coils.	2.1	Established OHS risk control work measures are followed.
	2.2	Winding machines are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Winding wire and insulation is selected in accordance with work instructions and established routines.
	2.4	Winding formers and machine is set-up in accordance with routine instructions.
	2.5	Prescribed solutions are used to resolve work

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ELEMENT	PERFORMANCE CRITERIA	
		completion issues.
	2.6	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.
	2.7	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	OHS measures work completion risk control are followed.
	3.2	Work report forms/data sheets are completed accurately.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and winding coils.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies

KS01-EG150A Coil winding and coil testing

Evidence shall show an understanding of coil winding and coil testing to an extent indicated by the following aspects:

T1 Coil data to be collected:

- Type of wire.
- Gauge.
- Number of turns.
- Type of coil.
- Type of insulation.
- Coil shape.

T2 Coil former types and construction/set up

- Coil shapes
- Factors which govern coil shape:
- end room;
- coil flexibility;
- bore size of stator iron core;
- depth of iron below the slots, in the iron core;
- pressure points between the coils
- Types coil winding formers

T3 Coil winding machines

- Identify machine types:
- foot pedal,
- variable speed,
- winding head fitted with a chuck;
- Remote foot switch on a flexible lead, variable speed fitted with a face plate;
- layer winding machine;
- computer operated
- Operational safety precautions

T4 Coil insulations.

- Purpose

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REQUIRED SKILLS AND KNOWLEDGE

- Temperature ratings
- Common insulating materials
- Polyester film backed elephantide; Nomex;
- Mylar;
- Nomex/mylar/nomex; Dacron/mylar/dacron;
- cloth, tape, and adhesive tape (glass); polyester glass laminate;
- sheet, tape, and adhesive tape (polyester film);
- Bakelite paper laminates

T5 Rewind small and medium size solenoid coils

- Strip and record data
- Prepare/insulate coil formers
- Wind each type of coil
- Finishing off process
- Test procedures

T6 Types of testing devices

- Multimeter;
- Series light;
- Insulation resistance tester;
- Wheatstone bridge

T7 Purpose of testing devices

- Multimeter;
- Series lamp;
- Insulation resistance tester;
- Wheatstone bridge

T8 Types of tests

- Continuity
- Short circuited turns
- Insulation resistance

T9 Testing techniques to identify faulty coils

- Physical inspection.
- Using a testing device.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Winding coils as described as described in 8) and including:

A Following winding specifications.

B Selecting correct winding wire and insulation.

C Setting up and operating winding machine.

D Adhering to quality procedures.

E Completing work report/forms accurately.

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F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to winding coils.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary

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equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to winding at least four different types of coils in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG151A Place and connect electrical coils

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers insulating, placing and connecting electrical coils, in an small armatures/stators, transformers and solenoid equipped devices. The unit encompasses working safely, using hand and powered tools, measuring, applying basic knowledge of electrical circuits, connecting conductors following technical instructions and set procedures and recording work activities.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG150A	Wind electrical coils

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills	**5)** qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to place and connect coils.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	Work instructions are identified, obtained and understood.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Materials required for the work are obtained in accordance with established routines and procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Place and connect coils.	2.1	Established OHS risk control work measures are followed.
	2.2	Machines/equipment is checked as being isolated where necessary in strict accordance OHS requirements and procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Coils and insulation are selected in accordance with work instructions and established routines.
	2.4	Insulation is cut and applied in accordance with work instructions and established routines.
	2.5	Coils are place in accordance with work instructions and established routines.
	2.6	Coils ends are prepared and connections made in accordance with work instructions and established routines.
	2.7	Prescribed solutions are used to resolve work completion issues.
	2.8	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.
	2.9	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	OHS measures work completion risk control are followed.
	3.2	Work report forms/data sheets are completed accurately.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and placing and connecting coils.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG151A Electrical winding and connections

Evidence shall show an understanding of electrical winding and connections to an extent indicated by the following aspects:

T1 Winding wires.

- Types of winding wires.
- Winding wire varnishes.
- Varnish temperature ratings.
- Varnish removal methods.
- Types of varnish.
  - Air drying
  - Baking
  - Epoxy
- Dangers relating to handling
- Methods of application.
  - Brush.
  - Spray.
  - Dip.
  - Trickle.
- Measuring wires.
  - Gauge.
  - Micrometer.`

T2 Applications of winding wires

- Solenoid
- Stator windings
- Armature windings.
- Transformer windings
- Induction coils.

T3 Methods of winding wire connection

- Conductor preparation.
- Joining methods – soft soldering

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REQUIRED SKILLS AND KNOWLEDGE

- Types of soldering irons and tips
- Types of solder
- Fluxes: purpose; types; dangers
- Soldering process
- Inspection

- Hard soldering - Silver soldering
  - Advantages
  - Types of silver soldering wire
  - Types of flux
  - Operation and safe working procedures with the oxy acetylene welding torch
  - Preparation of join
  - Silver soldering process and inspection
- Fusing
  - Advantages
  - Preparation of join
  - Fusing process
  - Safe working procedures

T4 Insulation methods.

T5 Basic techniques in insulating coils for electrical static and rotating machines.

- Methods of insulating coils.
- Types of insulation used.
- Precautions.

T6 Coil types.

- Universal motor field coils (single phase);
- Distributed concentric coil group (single phase/three phase);
- Distributed “D” or mush shape coil group (three phase);
- Distributed round end (three phase);
- Distributed diamond shape coil group wound as individual coils (three phase)

T7 Basic techniques in placing coils for electrical static and rotating machines

- Record data
- Manufacture for universal field coils
- Coil finishing:
- insertion into slots;
- taping (where applicable);
- connection for correct polarity
- Electrical testing

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Place and connect coils as described as described in 8) and including:

A Following winding specifications.

B Selecting correct coils and insulation.

C Cutting insulation and place insulation and coils without damage.

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D	Connecting coils correctly.
E	Adhering to quality procedures.
F	Completing work report/forms accurately.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to placing and connecting coils.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3

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'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to placing and connecting electrical coils for a small armatures/stators and single phase transformers or solenoid equipped devices in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG152A Rewind single phase machines

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers dismantling and winding stators for single-phase machines. It encompasses working safely, using hand and powered tools, measuring, applying basic knowledge of electrical circuits and winding data, following technical instructions, and set procedures and recording work activities.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG150A	Wind electrical coils
UEENEEG151A	Place and connect electrical coils

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to rewind single phase machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	Work instructions are identified, obtained and understood.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Single phase machine is dismantled and parts tagged and stored to prevent loss or damage.
	1.6	Winding data is obtained from record or from work supervisor in accordance with established routines.
	1.7	Winding is stripped from stator in accordance with established routines.
	1.8	Materials required for the work are obtained in accordance with established routines and procedures.
	1.9	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Rewind single phase machines.	2.1	Established OHS risk control work measures are followed.
	2.2	Machines/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Single phase machine is dismantled and parts tagged and stored to prevent loss or damage.
	2.4	Winding is stripped from stator in accordance with established routines.
	2.5	Stator is wound and insulated in accordance with winding data and established routines.
	2.6	Machine is assembled and prepares for testing.
	2.7	Prescribed solutions are used to resolve work completion issues.
	2.8	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.
	2.9	Work is completed in acceptable timeframe given environment and workplace conditions.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work report.	3.1	OHS measures work completion risk control is followed.
	3.2	Work report forms/data sheets are completed accurately in accordance with established routines.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and rewinding single phase machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG152A Single phase machine winding

Evidence shall show an understanding of electrical winding and connections to an extent indicated by the following aspects:

T1 Techniques of winding single phase machines.

- Electrical machine insulation types and applications
- Coil placement techniques
- Coil connection arrangements and terminations
- Winding insulation methods

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Evidence Guide

EVIDENCE GUIDE

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The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Rewind single phase induction machines as described as described in 8) and including:

A Dismantling machine and storing parts securely.

B Preparing stator for winding.

C Following winding specifications.

D Selecting correct coils and insulation.

E Winding and connecting stator correctly.

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F Assembling machine and preparing for testing.

G Adhering to quality procedures.

H Completing work report/forms accurately.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to rewinding single phase machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

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Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to dismantling and winding stators for single-phase machines in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG153A Rewind three phase low voltage induction machines

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers preparing, placing and connecting coils and insulating three phase stators and rotors. It encompasses working safely, using hand and powered tools, measuring, applying knowledge of electrical circuits and stator windings, using testing devices, applying technical and quality standards and keeping winding records.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG150A	Wind electrical coils
UEENEEG151A	Place and connect electrical coils

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to rewind three phase induction machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures for work preparation are followed.
		1.3	The extent of the work is determined from job sheets, specifications and regulatory requirements.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively

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ELEMENT	PERFORMANCE CRITERIA	
		with others.
	1.5	Induction machine is dismantled and parts tagged and stored to prevent loss or damage.
	1.6	Winding data is obtained from winding data records or directly from measurements of stator and recorded in accordance with established procedures.
	1.7	Winding is stripped from stator in accordance with established procedures.
	1.8	Materials required for the work are obtained in accordance with established procedures and procedures.
	1.9	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Rewind three phase induction machines.	2.1	Established OHS risk control work measures are followed.
	2.2	Machines/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Induction machine is dismantled and parts tagged and stored to prevent loss or damage.
	2.4	Winding is stripped from stator in accordance with established procedures.
	2.5	Stator is wound and insulated in accordance with winding data and established procedures.
	2.6	Machine is assembled and prepares for final testing in accordance with established procedures.
	2.7	Prescribed solutions are used to resolve work completion issues.
	2.8	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.

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ELEMENT	PERFORMANCE CRITERIA	
	2.9	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	OHS measures work completion risk control is followed.
	3.2	Work report forms/data sheets are completed accurately in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and rewinding three phase induction machines rated for low voltage.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG153A Low voltage three phase motor winding techniques

Evidence shall show an understanding of single phase machine winding to an extent indicated by the following aspects:

T1 Alternator windings encompassing:

- Elementary single-phase stator winding
- Elementary three-phase stator winding
- Half-coil and whole-coil windings
- Concentrated and distributed windings
- Chain, lap and wave windings
- Pole-pitch and coil-span
- Half-coil winding for a three-phase alternator
- Whole-coil stator winding for a three-phase alternator

T2 Rating, cooling and regulation encompassing:

- Rating of alternators
- Cooling of alternators
- The voltage regulator

T3 Testing techniques encompassing:

- Continuity
- Insulation testing
- Use of ‘growler’
- Magnetic field testing

T4 Techniques of winding three phase motors.

- Electrical machine insulation types and applications
- Coil placement techniques
- Coil connection arrangements and terminations
- Winding insulation methods

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Rewind three phase induction machines rated for low voltage as described as described in 8) and including:

A Dismantling machine and storing parts securely.

B Preparing stator for winding.

C Following winding specifications.

D Selecting correct coils and insulation.

E Winding and connecting stator correctly.

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F Assembling machine and preparing for testing.

G Adhering to quality procedures.

H Completing work report/forms accurately.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to rewinding three phase induction machines rated for low voltage.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG15 7A Conduct electrical tests on LV electrical machines

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to dismantling and winding stators for at least three different three-phase induction machines in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG154A Rewind LV direct current machines

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers preparing, placing and connecting coils and insulating direct current motor armatures and poles. It encompasses working safely, using hand and powered tools, measuring, applying knowledge of electrical circuits and stator windings, using testing devices, applying technical and quality standards and keeping winding records.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG150A	Wind electrical coils
UEENEEG151A	Place and connect electrical coils

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to rewind direct current machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	The extent of the work is determined from job sheets, specifications and regulatory requirements.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Induction machine is dismantled and parts tagged and stored to prevent loss or damage.
	1.6	Winding data is obtained from winding data records or directly from measurements of stator and recorded in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.7	Winding is stripped from stator in accordance with established procedures.
	1.8	Materials required for the work are obtained in accordance with established procedures and procedures.
	1.9	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Rewind direct current machines.	2.1	Established OHS risk control work measures are followed.
	2.2	Machines/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Induction machine is dismantled and parts tagged and stored to prevent loss or damage.
	2.4	Winding is stripped from stator in accordance with established procedures.
	2.5	Armature and fields are wound and insulated in accordance with winding data and established procedures.
	2.6	Machine is assembled and prepares for final testing in accordance with established procedures.
	2.7	Prescribed solutions are used to resolve work completion issues.
	2.8	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.
	2.9	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	OHS measures work completion risk control is followed.
	3.2	Work report forms/data sheets are completed accurately in accordance with established

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ELEMENT	PERFORMANCE CRITERIA
	procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and rewinding direct current machines rated for low voltage.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG154A Direct current motor winding techniques

Evidence shall show an understanding of direct current motor winding techniques to an extent indicated by the following aspects:

T1 Principles and construction encompassing:

- Direct-current machine types
- Construction of direct-current machine
- Types of armature windings
- Parallel circuits in armature windings
- Value of generated e.m.f.

T2 Direct current armature windings encompassing:

- Terms used in armature winding
- Lap and wave windings
- Progressive and retrogressive windings.

T3 Simplex lap windings encompassing:

- Simplex lap armature winding
- Commutator pitch
- Number and position of brushes
- Characteristics of simplex lap windings
- Equalising connections for armature windings
- Applications for lap windings.

T4 Simplex wave windings encompassing:

- Simplex wave armature winding
- Commutator pitch
- Number and position of brushes
- Dummy coils
- Characteristics of simplex wave windings
- Applications of wave windings
- Comparison of lap and wave windings
- Armature winding calculations.

T5 Commutation and interpoles encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Principles of commutation
- Conditions for sparkless commutation
- Methods used to reduce sparking
- Resistance commutation
- e.m.f. commutation
- Interpoles or commutating poles
- Advantages of interpoles.

T6 Testing techniques encompassing:

- Continuity
- Insulation testing
- Use of ‘growler’
- Magnetic field testing

T7 Critical details and measurements when stripping a stator of a DC machine.

- Types of windings.
- Wave winding.
- Lap winding with equalisers
- Winding layout.

T8 Procedures and precautions required when inspecting and/or re-using a commutator

- Removal of armature leads on TIG welded commutator.
- Dimensioned to be checked.
- TIG Welded and soft soldered commutators.
- Coil position and commutator segment relationship.
- Commutator wear ring.

T9 Preparation for rewinding.

- Checking the condition of a:
- Stripped core.
- Commutator.
- Removing of old winding.
- Core loss test.
- Hot spots in armature core.
- Testing commutator before use.

T10 Selection of appropriate insulation.

- Reason for selecting a particular insulation.
- Dielectric strength.
- Temperature rating.
- Manufactures recommendations.
- Standards.

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REQUIRED SKILLS AND KNOWLEDGE

- Insulation properties, method of application and specific uses for:
- B stage insulation
- VPI insulation
- Insulations used on the slot portion and overhang.

T11 Calculations and insulation specifications.

- Preparation of coils and equalisers.
- Manufactures specifications.
- Calculation of a half coil length and the amount of copper required.
- Preparation of copper prior to insulating coils and equalisers on armatures;
  - Commutators.
  - TIG welded.
  - Soft soldered.
  - Identification of insulation specifications.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in

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accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as

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specified in the performance criteria and range statement

- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Rewind direct current machines rated for low voltage as described as described in 8) and including:

A Dismantling machine and storing parts securely.

B Preparing stator for winding.

C Following winding specifications.

D Selecting correct coils and insulation.

E Winding and connecting armature and fields correctly.

F Assembling machine and preparing for testing.

G Adhering to quality procedures.

H Completing work report/forms accurately.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

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OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to rewinding direct current machines rated for low voltage.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG15 7A Conduct electrical tests on LV electrical machines

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to dismantling and winding armatures and field coils for at least three different direct current machines in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG155A Rewind HV three phase induction machines rated for voltages to 3.3 kV

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers preparing, placing and connecting coils and insulating three phase stators and rotors rated for high voltage to 3.3 kV. It encompasses working safely, using hand and powered tools, measuring, applying knowledge of electrical circuits and HV stator windings, applying technical and quality standards and keeping winding records.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG150A	Wind electrical coils
UEENEEG151A	Place and connect electrical coils
UEENEEG153A	Rewind three phase low voltage induction machines

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to rewind three phase induction machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	The extent of the work is determined from job sheets, specifications and regulatory requirements.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Induction machine is dismantled and parts tagged and stored to prevent loss or damage.
	1.6	Winding data is obtained from winding data records or directly from measurements of stator and recorded in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.7	Winding is stripped from stator in accordance with established procedures.
	1.8	Materials required for the work are obtained in accordance with established procedures and procedures.
	1.9	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Rewind three phase induction machines.	2.1	Established OHS risk control work measures are followed.
	2.2	Machines/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures. (see Note 1).
	2.3	Induction machine is dismantled and parts tagged and stored to prevent loss or damage.
	2.4	Winding is stripped from stator in accordance with established procedures.
	2.5	Stator is wound and insulated to 3.3 kV standards in accordance with winding data and established procedures.
	2.6	Machine is assembled and prepares for final testing in accordance with established procedures.
	2.7	Prescribed solutions are used to resolve work completion issues.
	2.8	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.
	2.9	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	OHS measures work completion risk controls are followed.
	3.2	Work report forms/data sheets are completed accurately in accordance with established

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ELEMENT	PERFORMANCE CRITERIA
	procedures. Note 1: Particular attention shall be given to following risk control measure related to high voltage hazards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and rewinding three phase induction machines rated for high voltage to 3.3 kV.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG155A High voltage three phase motor winding techniques rated to 3.3 kV

Evidence shall show knowledge and skills of high voltage three phase motor winding techniques rated to 3.3 kV to an extent indicated by the following aspects:

T1 HV winding conductors and their applications.

T2 HV winding wire connection methods encompassing:

- Conductor handling
- Conductor preparation
- Connection mediums

T3 Insulation types and methods

T4 Critical details and measurements when stripping a stator encompassing:

- Winding types

  Note.

  Example are hairpin wound stator and lap wound stator
- Winding diagram
- Wedges of a radially ventilated machine
- Factors to be considered when selecting cables for a stator.

T5 Procedures for checking the condition of a stripped in preparation for rewind encompassing:

- Manufacturers' specifications.
- Sequence of events between the removal of the old winding and the start of rewinding.
- Core loss test, the effect this test may have on the core and expected test results
- Methods of overcoming hot spots in a stator core.
- Level of insulation required to insulate the steel bracing rings that support the overhang.
- Difference between the slot liners and packers of a 3.3 kV machine.

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REQUIRED SKILLS AND KNOWLEDGE

T6 Procedures for the fitting of coils to core, wedging and bracing.

- Significance of the slot portion of coils for machines
- Method of inserting the coils of a ribbon winding into slots.
- Effects of undue mechanical stress on B stage insulated coils.
- Importance of coil pitch and why it is important.Sequence of events in fitting the first pole pitch group of coils in a lap winding
- Sequence of events in fitting the coils of a concentric winding
- Purpose and location of the excess packing in a slot.
- Difference between the wedges for a lap and hairpin winding.
- Method of fitting a wedge.
- Difference that may be encountered between the wedges for a radial ventilated and the wedges for an axially ventilated machine.
- Methods used to brace and strengthen the overhang of a lap winding and a hairpin winding

T7 Procedures for making inter turn and inter coil connections on a hairpin winding and inter coil connections on a lap and bar winding encompassing:

- Sequence of events in making turn to turn connections, and insulating the turns of a lap winding

  Note.

  Connection methods include silver solder or brazing and soft solder
- Sequence of events, from hand forming the coil to final insulation, in making the turn to turn connections in a hairpin winding, using a welded joint.
- Sequence of events in making the coil to coil connections in a bar winding.

T8 Testing according to British and IEC standards.

Note.

Examples of testing are 3.3 kV B stage insulated winding test and VPI winding test.

T9 Materials, procedures, tests and precautions required during and after the impregnation of completed windings according to Australian, British and IEC standards.

- Precautions to be taken when handling and using varnishes and resins.
- Important features of an oven used to cure large impregnated machines.
- Application and features of various impregnating materials

  Note.

  Examples are water based varnish, Xylol base varnish and 100% solids resin
- Method of carrying out a gel test on a resin and a viscosity test on a varnish
- Typical quality procedures carried out on an impregnating varnish.
- Procedure and precautions for carrying out the a hot dip impregnation, a flood coat impregnation and a VPI impregnation

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REQUIRED SKILLS AND KNOWLEDGE

- Tests to be carried out after impregnation and bake on a 3.3kV B stage insulated winding and a VPI winding

T10 Winding to terminal connections according to British and IEC standards.

- Criteria for selection of winding to terminal cables

  Note.

  Examples are voltage rating, full load current and fault capacity.
- Common types of terminal boxes and their structure.

  Note.

  Example are phase segregated, phase separated and phase insulated
- Method of making the joint between winding and terminal cables and insulating such a joint.

T11 Procedures and precautions to be followed when performing static electrical testing of a completed rewind according to Australian, British and IEC standards encompassing:

- Types and purpose of tests
- Testing safety precautions
- Testing procedures

  Note.

  Examples of tests are repetitive surge test, loss tangent test, polarisation index (PI) test, cold resistance test and polarity test.
- Interpretation of test results
- Calculation of winding cold resistance and line and phase resistance

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment,

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such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

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- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Rewind three phase induction machines rated for high voltage to 3.3 kV as described as described in 8) and including:

A Dismantling machine and storing parts securely.

B Preparing stator for winding.

C Following winding specifications.

D Selecting correct coils and insulation.

E Winding and connecting stator correctly.

F Assembling machine and preparing for testing.

G Adhering to quality procedures.

H Completing work report/forms accurately.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to rewinding three phase induction machines rated for high voltage to 3.3 kV

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency

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development in this unit may be arranged concurrently with unit:

UEENEEG15 8A Conduct electrical tests on HV electrical machines

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to dismantling and winding stators for at least two different three phase induction machines at for HV to 3.3 kV in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG156A Rewind HV three phase induction machines rated for voltages above 3.3 kV

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers preparing, placing and connecting coils and insulating three phase stators and rotors rated for high voltage above 3.3 kV. It encompasses working safely, using hand and powered tools, measuring, applying knowledge of electrical circuits and HV stator windings, applying technical and quality standards and keeping winding records.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG150A	Wind electrical coils
UEENEEG151A	Place and connect electrical coils
UEENEEG153A	Rewind three phase low voltage induction machines
UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to rewind three phase induction machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	The extent of the work is determined from job sheets, specifications and regulatory requirements.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Induction machine is dismantled and parts tagged and stored to prevent loss or damage.
	1.6	Winding data is obtained from winding data records or directly from measurements of stator and recorded in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.7	Winding is stripped from stator in accordance with established procedures.
	1.8	Materials required for the work are obtained in accordance with established procedures and procedures.
	1.9	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Rewind three phase induction machines.	2.1	Established OHS risk control work measures are followed.
	2.2	Machines/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures. (See Note 1).
	2.3	Induction machine is dismantled and parts tagged and stored to prevent loss or damage.
	2.4	Winding is stripped from stator in accordance with established procedures.
	2.5	Stator is wound and insulated to 3.3 kV standards in accordance with winding data and established procedures.
	2.6	Machine is assembled and prepares for final testing in accordance with established procedures.
	2.7	Prescribed solutions are used to resolve work completion issues.
	2.8	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.
	2.9	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	OHS measures work completion risk controls are followed.
	3.2	Work report forms/data sheets are completed accurately in accordance with established

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ELEMENT	PERFORMANCE CRITERIA
	procedures.
	Note 1:
	Particular attention shall be given to following risk control measures related to high voltage hazards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and rewinding three phase induction machines rated for high voltage above 3.3 kV.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG156A High voltage three phase motor winding techniques rated above 3.3 kV

Evidence shall show knowledge and skills of high voltage three phase motor winding techniques rated above 3.3 kV to an extent indicated by the following aspects:

T1 HV winding conductors and their applications.

T2 HV winding wire connection methods encompassing:

- Conductor handling
- Conductor preparation
- Connection mediums

T3 Insulation types and methods

T4 Critical details and measurements when stripping a stator encompassing:

- Winding types

  Note.

  Example are hairpin wound stator and lap wound stator
- Winding diagram
- Wedges of a radially ventilated machine
- Factors to be considered when selecting cables for a stator.

T5 Procedures for checking the condition of a stripped in preparation for rewind encompassing:

- Manufacturers' specifications.
- Sequence of events between the removal of the old winding and the start of rewinding.
- Core loss test, the effect this test may have on the core and expected test results
- Methods of overcoming hot spots in a stator core.
- Level of insulation required to insulate the steel bracing rings that support the overhang.
- Difference between the slot liners and packers of a 6.6 kV machine.

T6 Procedures for the fitting of coils to core, wedging and bracing.

- Significance of the slot portion of coils for machines above 3.3 kV
- Method of inserting the coils of a ribbon winding into slots.

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REQUIRED SKILLS AND KNOWLEDGE

- Effects of undue mechanical stress on B stage insulated coils.
- Importance of coil pitch and why it is important.
- Sequence of events in fitting the first pole pitch group of coils in a lap winding
- Sequence of events in fitting the coils of a concentric winding
- Purpose and location of the excess packing in a slot.
- Difference between the wedges for a lap and hairpin winding.
- Method of fitting a wedge.
- Difference that may be encountered between the wedges for a radial ventilated and the wedges for an axially ventilated machine.
- Methods used to brace and strengthen the overhang of a lap winding and a hairpin winding

T7 Procedures for making inter turn and inter coil connections on a hairpin winding and inter coil connections on a lap and bar winding encompassing:

- Sequence of events in making turn to turn connections, and insulating the turns of a lap winding

  Note.

  Connection methods include silver solder or brazing and soft solder
- Sequence of events, from hand forming the coil to final insulation, in making the turn to turn connections in a hairpin winding, using a welded joint.
- Sequence of events in making the coil to coil connections in a bar winding.

T8 Testing according to British and IEC standards.

Note.

Examples of testing are 6.6 kV B stage insulated winding and VPI winding test.

T9 Materials, procedures, tests and precautions required during and after the impregnation of completed windings according to Australian, British and IEC standards.

- Precautions to be taken when handling and using varnishes and resins.
- Important features of an oven used to cure large impregnated machines.
- Application and features of various impregnating materials

  Note.

  Examples are water based varnish, Xylol base varnish and 100% solids resin
- Method of carrying out a gel test on a resin and a viscosity test on a varnish
- Typical quality procedures carried out on an impregnating varnish.
- Procedure and precautions for carrying out the a hot dip impregnation, a flood coat impregnation and a VPI impregnation
- Tests to be carried out after impregnation and bake on a a 6.6 kV B stage insulated winding and a VPI winding

T10 Winding to terminal connections according to British and IEC standards.

- Criteria for selection of winding to terminal cables

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REQUIRED SKILLS AND KNOWLEDGE

Note.

Examples are voltage rating, full load current and fault capacity.

- Common types of terminal boxes and their structure.

  Note.

  Example are phase segregated, phase separated and phase insulated
- Method of making the joint between winding and terminal cables and insulating such a joint.

T11 Procedures and precautions to be followed when performing static electrical testing of a completed rewind according to Australian, British and IEC standards encompassing:

- Types and purpose of tests
- Testing safety precautions
- Testing procedures

  Note.

  Examples of tests are repetitive surge test, loss tangent test, polarisation index (PI) test, cold resistance test and polarity test.
- Interpretation of test results
- Calculation of winding cold resistance and line and phase resistance

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment

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is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace

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procedures and practices including the use of risk control measures as specified in the performance criteria and range statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Rewind three phase induction machines rated for high voltage above 3.3 kV as described as described in 8) and including:

A Dismantling machine and storing parts securely.

B Preparing stator for winding.

C Following winding specifications.

D Selecting correct coils and insulation.

E Winding and connecting stator correctly.

F Assembling machine and preparing for testing.

G Adhering to quality procedures.

H Completing work report/forms accurately.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to rewinding three phase induction machines rated for high voltage above 3.3 kV.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG155A	Rewind HV three phase induction machines rated for voltages to 3.3 kV
UEENEEG158A	Conduct electrical tests on HV electrical machines

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to dismantling and winding stators for at least two different three phase induction machines at for HV above 3.3 kV in an environment designed specifically for the purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG157A Conduct electrical tests on LV electrical machines

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers electrical safety and functional testing of electrical machines designed to operate at low voltage. The unit encompasses working safely, setting up and conducting continuity, insulation and short circuit and inspection and testing of iron circuit, interpreting and documenting test results and any resulting corrective actions.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

AND

UEENEEG150A	Wind electrical coils
UEENEEG151A	Place and connect electrical coils
UEENEEG1	Rewind three phase low voltage induction

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Prerequisite Unit(s) **4)**

53A	machines
OR	
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct electrical tests on three phase induction machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	The extent of the work is determined from job sheets, specifications and regulatory requirements.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Winding data is obtained from winding data records or directly from measurements of stator and recorded in accordance with established procedures.
	1.6	Winding is stripped from stator in accordance with established procedures.
	1.7	Materials required for the work are obtained in accordance with established procedures.
	1.8	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Conduct electrical tests on three phase induction machines.	2.1	Established OHS risk control work measures are followed.
	2.2	Machines/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	All necessary electrical tests are conducted to established cause of faults or operational condition of the machine.
	2.4	Status of the machine is determined from test results and recorded.
	2.5	Prescribed solutions are used to resolve work completion issues.
	2.6	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.
	2.7	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	OHS measures work completion risk controls are followed.
	3.2	The status of the machine is documented in accordance with established procedures and appropriate person(s) notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting electrical tests on low voltage electrical machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG157A Low voltage motor testing devices and techniques

Evidence shall show an understanding of electric motor mechanical measuring and testing devices and techniques to an extent indicated by the following aspects:

T1 Test/measuring devices and their application

- Test/measuring devices
  - multimeter.
  - growler.
  - Insulation resistance tester
  - Hi-pot testing
- Application.
  - continuity.
  - insulation.
  - short circuit
  - testing of magnetic circuit.

T2 Connection of test/measuring devices into a circuit encompassing:

- safety procedures.
- circuit arrangement of test/measuring devices.

T3 Taking and interpreting readings

With regards to:

- continuity.
- insulation.
- short circuit
- testing of magnetic circuit.

T4 Storage, maintenance and care of test/measuring devices

- Storage.
- Maintenance
- Care.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct electrical tests on low voltage electrical machines as described as described in 8) and including:

A Dismantling machine and storing parts securely.

B Setting up tests correctly.

C Taking test reading accurately.

D Determining the status of the machine correctly from test result.

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E Documenting the status of the machine clearly.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting electrical tests on low voltage electrical machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

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assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

OR

UEENEEG153A	Rewind three phase low voltage induction machines

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to conducting electrical tests on at least two different low voltage electrical machines with one of the machines having at least two winding faults. The purpose of the tests is to establishing:

- The causes of faults in machines, and
- Whether a machine has been correctly repaired and complies with all requirements

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG158A Conduct electrical tests on HV electrical machines

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers electrical safety and functional testing of electrical machines designed to operate at high voltage. The unit encompasses working safely, setting up and conducting continuity, insulation and short circuit and inspection and testing of iron circuit, interpreting and documenting test results and any resulting corrective actions.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG157A	Conduct electrical tests on LV electrical machines
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

AND

UEENEEG150A	Wind electrical coils
UEENEEG1	Place and connect electrical coils

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Prerequisite Unit(s) **4)**

51A

UEENEEG153A	Rewind three phase low voltage induction machines

OR

UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct electrical tests on three phase induction machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	The extent of the work is determined from job sheets, specifications and regulatory requirements.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Winding data is obtained from winding data records or directly from measurements of stator and recorded in accordance with established procedures.
	1.6	Winding is stripped from stator in accordance with established procedures.
	1.7	Materials required for the work are obtained in accordance with established procedures.
	1.8	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Conduct electrical tests on three phase induction machines.	2.1	Established OHS risk control work measures are followed.
	2.2	Machines/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures. (See Note

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ELEMENT	PERFORMANCE CRITERIA	
		1)
	2.3	All necessary HV electrical tests are conducted to established cause of faults or operational condition of the machine.
	2.4	Status of the machine is determined from test results and recorded.
	2.5	Prescribed solutions are used to resolve work completion issues.
	2.6	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.
	2.7	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	OHS measures work completion risk controls are followed.
	3.2	The status of the machine is documented in accordance with established procedures and appropriate person(s) notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting electrical tests on high voltage electrical machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG158A High voltage motor testing devices and techniques

Evidence shall show an understanding of HV motor testing devices and techniques to an extent indicated by the following aspects:

T1 Test/measuring devices and their application

T2 Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- circuit arrangement of test/measuring devices

T3 Taking and interpreting readings

T4 Storage, maintenance and care of test/measuring devices

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for

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apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct electrical tests on high voltage electrical machines as described as described in 8) and including:

A Dismantling machine and storing parts securely.

B Setting up tests correctly.

C Taking test reading accurately.

D Determining the status of the machine correctly from test result.

E Documenting the status of the machine clearly.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting electrical tests on high voltage electrical machines

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG15 7A Conduct electrical tests on LV electrical machines

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to conducting electrical tests on at least two different high voltage electrical machines with one of the machines having at least two winding faults. The purpose of the tests is to establishing:

- The causes of faults in machines, and
- Whether a machine has been correctly repaired and complies with all requirements

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG159A Conduct mechanical tests on electrical machines and components

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers mechanical safety and functional testing of electrical machines and their mechanical components. The unit encompasses working safely, setting up and conducting tests, taking measurements, interpreting and documenting test results and any resulting corrective actions.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG157A	Conduct electrical tests on LV electrical machines
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

AND

UEENEEG150A	Wind electrical coils
UEENEEG151A	Place and connect electrical coils
UEENEEG1	Rewind three phase low voltage induction

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Prerequisite Unit(s) **4)**

53A	machines
OR	
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct mechanical tests on electrical machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures for work preparation are followed.
	1.3	The extent of the work is determined from job sheets, specifications and regulatory requirements.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Machine data is obtained from data records or directly from measurements and recorded in accordance with established procedures.
	1.6	Winding is stripped from stator in accordance with established procedures.
	1.7	Materials required for the work are obtained in accordance with established procedures.
	1.8	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Conduct mechanical tests on three phase induction machines.	2.1	Established OHS risk control work measures are followed.
	2.2	Machines/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures. Note:

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ELEMENT	PERFORMANCE CRITERIA	
		Particular attention shall be given to following risk control measure related to high voltage hazards
	2.3	All necessary mechanical tests/measurements are conducted to established cause of faults or operational condition of the machine.
	2.4	Status of the machine is determined from test results and recorded.
	2.5	Prescribed solutions are used to resolve work completion issues.
	2.6	Routine quality checks are conducted to ensure coils are correctly wound with correct wire, number of turns and shape.
	2.7	Work is completed in acceptable timeframe given environment and workplace conditions.
3 Complete work report.	3.1	OHS measures work completion risk controls are followed.
	3.2	The status of the machine including specifications for any repair work required is documented in accordance with established procedures and appropriate person(s) notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting mechanical tests on electrical machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG159A Electric motor mechanical measuring and testing devices and techniques

Evidence shall show an understanding of electric motor mechanical measuring and testing devices and techniques to an extent indicated by the following aspects:

T1 Devices and techniques for measuring geometric attributes encompassing:

- Measuring device for geometric attributes.
- Dynamic balancing.
- Alignment of shafts.

T2 Operational Test/measuring devices and their application encompassing:

- Operational test/measuring devices.
- Applications.

T3 Setting up test/measuring devices encompassing:

- safety procedures
- set up procedures

T4 Taking and interpreting readings encompassing:

- Correct method.
  - Taking and interpreting reading
  - Dynamic balancing
  - Aligning shafts
  - Measuring roundness

T5 Storage, maintenance and care of test/measuring devices encompassing:

- Storage of mechanical measuring and testing devices.
- maintenance of mechanical measuring and testing devices.
- Care of mechanical measuring and testing devices

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct mechanical tests on electrical machines as described in 8) and including:

A Dismantling machine and storing parts securely.

B Setting up tests correctly.

C Taking test/measurements reading accurately.

D Determining the status of the machine correctly from test result.

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E Documenting the status of the machine clearly.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting mechanical tests on electrical machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

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assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG15 7A Conduct electrical tests on LV electrical machines

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to conducting mechanical tests on at least two different electrical mechanical with one of the machines having at least two mechanical faults. The purpose of the tests is to establishing:

- The causes of faults in machines, and
- Whether a machine has been correctly repaired and complies with all requirements

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG160A Evaluate performance of LV electrical machines

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers electrical and mechanical safety and performance evaluation of electrical machines across their load range. The unit encompasses working safely, setting up and conducting evaluation measurements, evaluating performance from measured parameters and documenting results and recommending any resulting corrective actions.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG157A	Conduct electrical tests on LV electrical machines
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG0	Solve problems in single and three phase

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Prerequisite Unit(s) **4)**

06A	low voltage machines
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
AND	
UEENEEG150A	Wind electrical coils
UEENEEG151A	Place and connect electrical coils
UEENEEG153A	Rewind three phase low voltage induction machines
OR	
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
AND	
UEENEEG143A	Develop engineering solution for synchronous machine and control problems
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems
AND	

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Prerequisite Unit(s) **4)**

UEENEEE129A	Solve electrotechnical engineering problems
OR	
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
OR	
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
AND	
UEENEEE104A	Solve problems in d.c. circuits
OR	
UEENEEH169A	Solve problems in basic electronic circuits
OR	
UEENEEG144A	Develop engineering solutions for d.c. machine and control problems
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems
AND	
UEENEEE1	Solve electrotechnical engineering

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Prerequisite Unit(s) **4)**

29A	problems
OR	
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
OR	
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
AND	
UEENEEE104A	Solve problems in d.c. circuits
OR	
UEENEEH169A	Solve problems in basic electronic circuits
OR	
UEENEEG145A	Develop engineering solutions for induction machine and control problems
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems
AND	

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Prerequisite Unit(s)

4)

UEENEEE129A	Solve electrotechnical engineering problems

OR

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits

OR

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

AND

UEENEEE104A	Solve problems in d.c. circuits

OR

UEENEEH169A	Solve problems in basic electronic circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to evaluate electrical machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Examination and testing area is checked for safety hazards and risk control measures implemented in strict accordance with safety policy and procedures.
	1.4	Relevant documentation is obtained and read to determine the certification/approval specifications for which the equipment is to be assessed.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2 Evaluate electrical machines.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	In depth knowledge of the performance requirements of the particular electrical machine under scrutiny is applied to the assessment process.
	2.5	Machine examination and tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
	2.6	Machine examination and tests are carried out methodically and results and comments systematically noted.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Assessment is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document evaluate results.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Examination and test results are evaluated and non-compliance issues identified.

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Examination, test results and comments on non-compliance issues are documented and reported to appropriate person(s) in accordance with established procedures.

Note 1:

Examples of documentation are those specifying safety requirements, technical standard, as marketed technical performance and product quality endorsement standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and evaluating performance of electrical machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG160A Performance standards and regulatory requirements for the electrical rotating machine

Evidence shall show an understanding of evaluating the performance of electrical machines to an extent indicated by the following aspects:

T1 Additional technical standards, regulations and codes for special electrical installations encompassing:

- caravan parks
- construction and demolition sites
- marinas
- medical treatment areas
- moveable premises
- HV installation in consumer's premises

T2 Electrical machines, performance monitoring encompassing:

- Methods of testing the condition of bearings
- Methods of testing the condition of windings and terminal boxes.
- Methods of testing the condition of the coolers
- Problems likely to be created due to lack of maintenance on brush gear.
- Method of testing the general condition of a machine by vibration analysis
- Methods of checking the condition of couplings, pulleys, belts and the like.
- Determining machine operating efficiency

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Evaluate performance of electrical machines as described as described in 8) and including:

A Interpreting compliance documents.

B Setting up and conducting appropriate examinations and tests.

C Identifying non-compliance defects.

D Reporting examination and test results and non-compliance

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issues clearly and accurately.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved

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industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to evaluating performance of electrical machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG159A	Conduct mechanical tests on electrical machines and components

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to at least two different types of electrical machine:

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG161A Design and develop modifications to LV electrical machines

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the performance and efficiency aspects of electrical machine design as applied to the modification of existing machines. It encompasses designing to given parameters including those related to safety and efficiency, adhering to compliance standards and compliance assessments and documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG160A	Evaluate performance of LV electrical machines
UEENEEG157A	Conduct electrical tests on LV electrical machines
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

AND

UEENEEG150A	Wind electrical coils
UEENEEG1	Place and connect electrical coils

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Prerequisite Unit(s) **4)**

51A

UEENEEG153A	Rewind three phase low voltage induction machines

OR

UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

AND

UEENEEG143A	Develop engineering solution for synchronous machine and control problems
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems

AND

UEENEEE129A	Solve electrotechnical engineering problems

OR

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits

OR

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Prerequisite Unit(s) **4)**

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
AND	
UEENEEE104A	Solve problems in d.c. circuits
OR	
UEENEEH169A	Solve problems in basic electronic circuits
OR	
UEENEEG144A	Develop engineering solutions for d.c. machine and control problems
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems
AND	
UEENEEE129A	Solve electrotechnical engineering problems
OR	
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
OR	
UEENEEH1	Troubleshoot resonance circuits in an

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Prerequisite Unit(s) **4)**

14A	electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
AND	
UEENEEE104A	Solve problems in d.c. circuits
OR	
UEENEEH169A	Solve problems in basic electronic circuits
OR	
UEENEEG145A	Develop engineering solutions for induction machine and control problems
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems
AND	
UEENEEE129A	Solve electrotechnical engineering problems
OR	
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
OR	

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Prerequisite Unit(s) **4)**

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

AND

UEENEEE104A	Solve problems in d.c. circuits

OR

UEENEEH169A	Solve problems in basic electronic circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design and develop modifications to electrical machines.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	The extents of modifications required are determined from performance test results and customer's requirements.
	1.3	Original specification documents for the machine are sought and received in order to check currency of compliance requirements. (see note 1)
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in or relying on outcomes of the work.
2 Design modifications to electrical machines.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	In depth knowledge of electrical machine and sustainable energy policies in improving machine efficiency is applied to modification design.
	2.3	Modifications are designed to comply with the requirements of Standards and regulations.
	2.4	Acceptance/approval for modification design is sought from appropriate person(s) in accordance with established procedures.
	2.5	Specifications and instructions for the modification work are documented and processed in accordance with requirements.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Solutions to unplanned or unforeseen events are provided consistent with safety and work outcomes.
3 Arrange modification work.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Arrangements are made for the modification work to be done in accordance with established procedures.
	3.3	A copy of modification specifications and instructions is provided to personnel responsible for carrying out the work.
	3.4	Strategies are implemented that verify that modification conforms to specifications.
	3.5	Solutions to unplanned or unforeseen events are provided consistent with safety and work outcomes.
4 Complete work and report	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Arrangements are made for formal certification of modifications where required by regulation or customer.
	4.3	Machine marking is revised to comply with performance parameters resulting from modifications.
	4.4	Modification and machine performance standard are documented and report issued to appropriate person(s) in accordance with established procedures.
	Note 1: Examples of documentation are those specifying safety requirements, technical standard, as marketed technical performance and product quality endorsement standards.	

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing and developing modifications to electrical machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG161A Electrical machine design

Evidence shall show an understanding of the design and development of modifications to electrical machines to an extent indicated by the following aspects:

T1 Motor windings principles and construction encompassing

- direct-current machine types
- construction of direct current machine
- types of armature windings
- parallel circuits in armature windings
- magnitude of generated e.m.f.

T2 Direct current armature windings encompassing:

- terms used in armature winding
- effects of chording
- lap and wave windings
- progressive and retrogressive windings

T3 Simplex lap windings encompassing:

- simplex lap armature winding
- commutator pitch
- number and position of brushes
- characteristics of simplex lap windings
- equalising connections for armature windings
- applications for lap windings

T4 Simplex wave windings encompassing:

- simplex wave armature winding
- commutator pitch
- number and position of brushes
- dummy coils
- characteristics of simplex wave windings
- applications of wave windings
- comparison of lap and wave windings
- armature winding calculations

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REQUIRED SKILLS AND KNOWLEDGE

T5 Commutation and interpoles encompassing:

- principles of commutation
- conditions for sparkless commutation
- methods used to reduce sparking
- resistance commutation
- e.m.f. commutation
- interpoles or commutating poles
- advantages of interpoles

T6 Alternator windings encompassing:

- elementary single-phase stator winding
- elementary three-phase stator winding
- half-coil and whole-coil windings
- concentrated and distributed windings
- chain, lap and wave windings
- pole-pitch and coil-span
- half-coil winding for a three-phase alternator
- whole-coil stator winding for a three-phase alternator

T7 Breadth factor and sinusoidal output encompassing:

- breadth factor
- e.m.f. equation for an alternator
- methods of obtaining sinusoidal wave form
- star and delta connection of alternator windings

T8 Rating, cooling and regulation encompassing:

- rating of alternators
- cooling of alternators
- the voltage regulator

T9 Testing techniques encompassing:

- continuity
- insulation testing
- use of ‘growler’
- magnetic field testing

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and develop modifications to electrical machines as described as described in 8) and including:

A Determining the extent of work correctly.

B Designing modification to meet requirements.

C Documenting modification specifications clearly.

D Arranging for formal certification of modifications.

E Completing final report.

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F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing and developing modifications to electrical machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing and developing modifications to at least two different types of electrical machines.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG162A Set up and place LV electrical apparatus and associated circuits into service

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers adjusting and setting up electrical apparatus before placing and checking that they operate as intended. It encompasses working safely and to standards, following specified set up procedures, ensuring safety devices are correctly set, evaluating apparatus and circuit operation against specified parameters and completing necessary documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

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License to practice **3)**

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measure and the like

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with

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Prerequisite Unit(s) **4)**

	electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading 4 Writing 4 Numeracy 4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set up electrical apparatus and associated controls	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate person(s).
	1.4	Setting up work is appropriately sequenced in accordance with job schedule
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	The location of electrical apparatus and controls is determined from site inspection and/or job specifications and diagrams
	1.7	Control setting and operating parameters are determined from job specifications and requirements.
	1.8	Tools, equipment and testing devices needed to commission the system are obtained in accordance with established procedures and checked for correct operation and safety
	1.9	Pre set up checks are undertaken to ensure all components are in place and secure.
	1.10	The need to test or measure a live and operating system is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
2 Set up electrical apparatus and associated controls	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Electrical apparatus and associated controls are adjusted to their required settings.
	2.5	Testing/measuring devices are used to observe the operation of electrical apparatus and fine adjustments of controls are made as necessary.
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.7	Setting up is conducted efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or

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ELEMENT	PERFORMANCE CRITERIA	
		services and using sustainable energy practices.
3 Document operational settings of electrical apparatus and associated circuits.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Results of setting up are documented including final operating parameters and an appropriate person or persons notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up and placing electrical apparatus and associated circuits into service.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG162A Commissioning processes and procedures

Evidence shall show an understanding of setting up and placing electrical apparatus and associated circuits into service to an extent indicated by the following:

T1 Commissioning processes and procedures encompassing:

- Purpose of commissioning
- Commissioning planning and documentation
- Procedures for configuring, calibrating and tuning systems during commissioning systems encompassing:
- Procedures for validating system performs to specification
- Procedures followed to commission instrument systems
- Purpose and importance of documentation

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up and place electrical apparatus and associated circuits into service as described as described in 8) and including:

A Selecting appropriate testing/measuring devices.

B Making initial adjustments of apparatus and controls correctly.

C Finely adjusting apparatus and controls based of measured observations.

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D Documenting final operating parameters accurately.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up and placing electrical apparatus and associated circuits into service.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to commissioning electrical apparatus and associated controls. Types of electrical apparatus and controls are motor switching and control, relevant parts of general electrical installations, process plants or production plant.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG164A Repair and maintain mechanical components of electrical machines

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the repair and maintain of mechanical components of electrical machines including basic machining. The unit encompasses working safely and to standards, following written instructions and drawing, selecting and setting up machine tools, basic machining, measuring and documenting work activities.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG111A	Carry out basic repairs to electrical components and equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills	**5)** qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair component.	1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards which have not previously been identified are reported and advise on risk control measures are sought from the work supervisor.
	1.4	The nature of repair work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established routines and procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
	1.8	Appropriate machine is selected, checked for safety and prepared for any necessary machining operation.
	1.9	Cutting tools are selected, sharpened and set up for correctly for each particular machining operation.
2 Repair components.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Component being machined is positioned and clamped appropriately.
	2.4	Machining is carried out safely and to suit the component and material being machined.
	2.5	Appropriate measurements are taken to ensure repairs comply with technical standards and job specifications and requirements.
	2.6	Components are repaired to comply with technical standards and job specifications and requirements.
	2.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.9	Ongoing checks of the quality of repair work are undertaken in accordance with established procedures.
	2.10	Repairs are carried out efficiently without unnecessary waste of materials and energy and damage to apparatus, circuits, the surrounding environment or services.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and report.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Fits are made to verify that repaired component conforms to requirements.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and repairing and maintaining mechanical components of electrical machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG164A Electrical machines, mechanical components

Evidence shall show an understanding of repairing mechanical components of electrical machines to an extent indicated by the following aspects:

T1 Dangers and safety precautions

- hazardous dust
- cleaning material
- safe working practices

- T2 Electrical Machine Bearings
  - Types of bearings
  - Bearing clearances
  - Techniques for removing and fitting bearings
  - Handling and storage of bearings
  - Lubrication of bearings
  - Calculation of bearing life
  - Bearing damage and remedial action
- T3 Machines Couplings
  - Types of couplings, applications
  - Fitting and aligning couplings
  - Types of belts and their applications
  - Fittings and aligning pulleys
- T4 Machine
  - components of electrical machines
- T5 Machine faults and testing procedures
  - faults
  - testing
  - inspecting
- T6 Dismantling /assembling and repair procedures
  - marking of electrical connections
  - recording positions of gears/pulleys/couplings
  - dismantle procedures

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REQUIRED SKILLS AND KNOWLEDGE

- bearing removal/replacement
- test run

- T7 Brushes
  - characteristics
  - types
  - selection
- T8 Removal and installation
  - marking of winding connections
  - motor alignment
  - alignment procedures

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

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access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Repair mechanical components of electrical machines as described as described in 8) and including:

A Establishing the nature of the repair work.

B Selecting appropriate method of repair.

C Sharpening cutting tools/twist drills correctly.

D Securing work piece correctly.

E Repairing component to required standard.

F Documenting repairs in accordance with established procedures.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

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Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to repairing mechanical components of electrical machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to repairs and maintenance of at least two of the following electrical machine components:

- Shaft
- Bearing housing
- End shield
- Fan
- Coupling
- Machine housing

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG165A Maintain and service traction lifts systems and equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers maintenance and servicing of traction lift systems and equipment. It encompasses working safely, conducting site cleaning, lubricating and painting lift equipment, inspecting of suspension, governors, compensators, floor selector and tappet switch ropes, and carrying out periodic testing on lift safety gear.

Application of the Unit

Application of the Unit **2)**

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

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Prerequisite Unit(s) **4)**

UEENEEG116A	Diagnose and rectify faults in traction lift systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to maintain and service lift equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The likely extend of work to be undertaken is envisaged from maintain procedures or fault/breakdown reports and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Maintain and service lift equipment.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measured and devised and implemented in consultation with appropriate personnel.
3 Completion and report of maintain and servicing activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.

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ELEMENT	PERFORMANCE CRITERIA
	3.3 Maintenance work activities are documented in accordance with established procedures. Note. Examples of documentation are components fault reports, test results, authorisations, permits, parts/component dispatch and store records

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining and servicing traction lifts.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG165A Lift systems - lift component

Evidence shall show an understanding of the maintenance and servicing of traction lifts to an extent indicated by the following aspects:

T1 Lubricant selection for lift components encompassing:

- Corrosion protection
- Friction reduction
- Cooling
- Viscosity
- Lubricant loss and loss estimation
- Suitable oils, greases, coolants, rust preventatives and solvents for particular devices

T2 Lubricant application for lift components encompassing:

- Hand, Grease guns,
- Oil cans,
- Pressure lubricators,
- Oil misters,
- Level indicators,
- Estimating quantities,
- Lubrication points
- Automatic lubricators

T3 Lift systems single and multiple wrap roping, types of ropes and their attachments encompassing:

- Hoisting
- Governor
- Tappet
- Compensator
- Selector
- Normal lay rope
- Langs lay rope
- Standard ends attachments
- Splices

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REQUIRED SKILLS AND KNOWLEDGE

- Wedge sockets
- Talurit fitting
- Babbit sockets
- Secon fitting

T4 Lift systems basic rope inspection encompassing: Lift systems basic rope inspection encompassing:

- Requirements of Lift Code/enterprise
- Purpose
- Wear
- Broken strands
- Diameter
- Deformation
- Corrosion
- Lubrication
- Tension

T5 Rope stretch encompassing:

- Requirements of Lift Code/enterprise
- Counterweight clearance
- Compensatory equipment

T6 Inspection of rope attachments encompassing:

- Requirements of Lift Code/enterprise
- Rope anchor rods
- Castings, Springs
- Wedges
- Swaging
- Checking for fracturing
- Deformation
- Remedial action

T7 Inspection of sheaves encompassing:

- Groove condition
- Rifling
- Ropes down in sheaves
- Maintenance records

T8 Maintenance, replacement and adjustment of mechanical lift components encompassing:

- Door locks
- Air cords
- Selectors

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REQUIRED SKILLS AND KNOWLEDGE

- Bearings; roller, sleeve, guide shoes, and slipper
- Door guides
- Landing doors
- Car doors
- Tapes/chains
- Motor room equipment
- Well equipment
- Pit equipment

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment

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- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain and service traction lifts as described as described in 8) and including:

A Conduct site cleaning, lubricating and painting of lift equipment.

B Inspect lift ropes.

C Maintain electro-hydraulic lift equipment.

D Carry out lift safety gear periodic testing.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to maintaining and servicing traction lifts.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

- Competency shall be demonstrated in relation to maintaining and servicing at least two of the lift equipment as following:
  - Geared traction drive
  - Gearless traction drive
  - Drum drive
  - Suspended electro-hydraulic drive
- At least two of the roping systems as following:
  - Single or double wrap
  - Single or multiple fall
  - Side slung or underslung
  - Overhead or basement drive
  - Drum drive.
- And at least two of the components as following:
  - Suspension ropes
  - Governor ropes
  - Tappet ropes
  - Compensator ropes
  - Floor selector tapes/ropes
- All safety gear periodic tests as following:
  - Governor type A
  - Governor type B
  - Governor type C

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG166A Install and maintain escalators, moving walks and treadways

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation and maintenance of escalators, moving walks and treadways. It encompasses working safely, installing and maintaining escalators, moving walks and tread ways such as repair or replacement of escalator handrails, cleaning, lubricating, replacement and adjustment of escalator/moving walk/tread way mechanical components and/or the installation and commissioning of escalators/moving walks/tread ways.

Application of the Unit

Application of the Unit **2)**

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG1	Terminate cables, cords and accessories for

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Prerequisite Unit(s) **4)**

06A	low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG116A	Diagnose and rectify faults in traction lift systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and maintain of escalators, moving walks and treadways.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The likely extend of work to be undertaken is envisaged from maintain procedures or plans/specifications and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Install and maintain escalators, moving walks and/or treadways	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measured and devised and implemented in consultation with appropriate personnel.
	2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.7	Ongoing checks of the quality of installed/maintain apparatus are undertaken in

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ELEMENT	PERFORMANCE CRITERIA	
		accordance with established procedures.
	2.8	Apparatus installation/maintenance is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
3 Completion and report of install and maintain activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.
	3.3	Maintenance work activities are documented in accordance with established procedures. Note. Examples of documentation are components fault reports, test results, authorisations, permits, parts/component dispatch and store records
	3.4	Final checks are made to that the installed/maintained apparatus conforms to requirements.
	3.5	‘As-installed’ apparatus and associated equipment is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintenance of escalators, moving walks and treadways.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG166A Escalators, moving walk and treadway mechanics

Evidence shall show an understanding of installing and maintaining escalators, moving walks and tread ways to an extent indicated by the following aspects:

T1 Escalators and moving walks components encompassing:

- Machine Brakes
- Controller
- Safety devices
- Balustrade lighting
- Steps/pallets/belts
- Hand rail
- Drive chain
- Truss
- Track systems
- Step/pallet chains
- Rollers, Tension carriage
- Hand rail earthing

T2 Lubricant selection for escalator components encompassing:

- Corrosion protection
- Friction reduction
- Cooling
- Viscosity
- Lubricant loss and loss estimation
- Suitable oils, greases, coolants, rust preventatives and solvents for particular devices

T3 Lubricant application for escalator components encompassing:

- Hand, Grease guns,
- Oil cans,
- Pressure lubricators,
- Oil misters,
- Level indicators,

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REQUIRED SKILLS AND KNOWLEDGE

- Estimating quantities,
- Lubrication points
- Automatic lubricators

T4 Escalators basic principles encompassing:

- Statutory and enterprise requirements: Lift Code, OHS, emergency stop, danger signage, barriers and running clearances
- Purpose of controller, safety devices, chain/steps and hand rail
- Techniques for repair of steps/belts/pallets, combs, guards, balustrades, Newel rollers, balustrade lighting and hand rails
- Adjustments of chains, hand rail, brake, steps and safety devices

T5 Escalator safe working procedures encompassing:

- Removing steps/pallets
- Working in motor room/pit
- Cleaning/lubricating
- Guards
- Hand rails remove/refit

T6 Escalator installation and commissioning encompassing:

- Aligning
- Testing
- Handling
- Running clearances

T7 Escalator types to suit applications encompassing:

- Factors
- volume of people
- Gradient
- Multi floor use

T8 Moving walks encompassing:

- Types; Continuous belts and palletised types
- Statutory requirements: OHS, Lift Code
- Comparison with escalator

T9 Tread Ways encompassing:

- Belt and palletised types
- Statutory requirements, OHS, Lift Code

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintenance of escalators, moving walks and treadways as described in 8) and including:

A Escalators.

B Moving walks.

C Treadways.

D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated

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in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installation and maintenance of escalators, moving walks and treadways.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate

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the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to installing and maintaining at least one of the following:

- Escalators (single or multiple units)
- Moving walks (single or multiple units)
- Treadways (belt or pallet type)
- At least five of the following:
  - Handrails
  - Steps
  - Pallets
  - Step-chains and associated driving equipment
  - Chains
  - Combs
  - Guards
  - Balustrades
  - Step rollers
  - Newel rollers
  - Motors
  - Controllers
  - Safety devices

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG167A Align and install traction lift equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers alignment and installation of lift mechanical and electrical equipment. It encompasses working safely, alignment of lift structures such as measuring, marking out and aligning of lift installations including machine room equipment, lift well equipment, the lift car and associated equipment and landing door frames and doors, setting out of multiple lift wells in varying configuration and the installations of well and pit equipment, lift car equipment, superstructure and counterweights, machine room equipment, landing, door frames and door, landing buttons and indicator boxes.

Application of the Unit

Application of the Unit

2)

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit

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Prerequisite Unit(s) **4)**

UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG116A	Diagnose and rectify faults in traction lift systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to align and install lift equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The likely extend of work to be undertaken is envisaged from site plans, drawings and specifications and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Tools, equipment and alignment devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Align and install lift equipment.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Equipment are installed straight and square in the required locations and within acceptable tolerances.
	2.5	Equipment align and install in accordance with manufacture’s specifications and regulatory requirements.
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.7	Unexpected situations are dealt with safely and

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ELEMENT	PERFORMANCE CRITERIA	
		with the approval of an authorised person.
	2.8	Ongoing checks of the quality of installed equipment are undertaken in accordance with established procedures.
	2.9	Equipment installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3 Completion and report of alignment and installation activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to that the installed equipment conforms to requirements.
	3.4	‘As-installed’ equipment is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and aligning and installing lift equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG167A Lift systems - installation

Evidence shall show an understanding of aligning and installing lift equipment to an extent indicated by the following aspects:

T1 Single lift wells encompassing:

- Purpose
- Need for accuracy
- Modification of errors
- Use of template
- Use of plumb lines and weights
- Measuring and marking out lift wells
- Measuring and marking out machine room (where appropriate)
- Plumbing chart
- Identification of clearances
- Adjustment of templates
- Use of laser level

T2 Multiple lift wells encompassing:

- Use of centre line/datum
- Use of survey information and layouts
- Setting of well templates
- Plumb charts analysis for three dimensional impact
- Corrective action
- Use of theodolite

T3 Fixing devices and methods encompassing:

- Inserts
- Expansion anchors
- Chemically bonded anchors

T4 Equipment layout encompassing:

- Specifications
- Clearances
- 3D impact on layout

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REQUIRED SKILLS AND KNOWLEDGE

- Lift code

T5 Alignment equipment encompassing:

- Gauges
- Straight edges
- Rail gauges
- Shims/packers
- Lasers

T6 Machine room alignment encompassing:

- Machine and fixings
- Diverter sheave
- Governor and tensioning sheaves
- Counterweight centre lines
- Sheave and roping system

T7 Lift car alignment encompassing:

- Superstructure
- Frames
- Doors

T8 Lift well alignment encompassing:

- Guides and brackets
- Trimmer beams
- Buffers
- Landing doors and locks
- Compensators

T9 Running clearances encompassing:

- Safety gear
- Car sill
- Door operator

T10 Car operating devices encompassing:

- Slowdown switch
- Limits
- Inductors
- Door locks
- Vanes and Shaft information

T11 Installation and aligning hydraulic equipment procedure encompassing:

- Ram/Cylinder
- Hydraulic Lines
- Bleeding Hydraulic system

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment

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instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Align and install lift equipment as described in 8) and including:

Install at least two types of the following lift equipment as described below

A Lift well equipment.

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B Lift cars.

C Machine room equipment.

Carry out at least two types of set out and alignment functions as listed below:

A Lift well alignment.

B Lift car alignment.

C Machine room alignment.

D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

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The resources used for assessment should reflect current industry practices in relation to aligning and installing lift equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to align and install at least two of the following:

- Lift well equipment
- Lift cars
- Machine room equipment
- Lift well alignment
- Lift car alignment
- Machine room alignment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG168A Diagnose and rectify faults in complex lift systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers diagnosing and rectifying faults in complex traction lift systems and equipment. It encompasses working safely; replacing and/or adjustment of solid state/electrical circuitry and components, diagnosing and repairing of complex faults in lift circuits and associated components (including governors, brakes, safety gear, safety devices, lift machines, door components and controllers).

Application of the Unit

Application of the Unit **2)**

This unit applies to any formal recognition for this standard at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of

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License to practice **3)**

training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

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Prerequisite Unit(s) **4)**

UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG116A	Diagnose and rectify faults in traction lift systems
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI139A	Diagnose and rectify faults in digital controls systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The likely extend of work to be undertaken is envisaged from maintain procedures or fault/breakdown reports and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measured and devised and implemented in

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ELEMENT	PERFORMANCE CRITERIA	
		consultation with appropriate personnel.
	2.5	Logical diagnostic methods are applied to diagnose lift system apparatus faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.6	Suspected fault scenarios are tested as being the cause(s) of system fault.
	2.7	Cause of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the lift systems.
	2.8	Faults in the lift components of the system are rectified to raise apparatus and system to its operational standard.
	2.9	System is tested to verify that the system operates as intended and to specified requirements
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Completion and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.
	3.3	Rectification of faults is documented in accordance with established procedures. Note. Examples of documentation are components

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ELEMENT	PERFORMANCE CRITERIA	
		fault reports, test results, authorisations, permits, parts/component dispatch and store records
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectification of faults in complex lift systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG168A Lift components and systems - electrical/electronic

Evidence shall show an understanding of diagnosing and rectifying faults in complex lift systems to an extent indicated by the following aspects:

T1 Traction lifts encompassing:

- Lift control circuits (relay logic only): floor selector circuitry,
- Machine room control (selector) and well control (transducer) circuitry - direction slowing and stopping, re-levelling, door operator, acceleration, button, indicator/lantern, lights and emergency lights, travelling cables, key switch circuits, fans, main supply and power circuits

T2 Safety circuits encompassing:

- Type, operation and actuation
- landing door locks, car door locks, emergency stop, pit switch, car trap-door switch, fire service, car top switch, tappet switch, governor switch, and safety gear switch, reverse phase relay, phrase failure relay and limit switches.

T3 Maintenance, replacement and adjustment encompassing:

- Electrical and electronic lift components - travelling cables, tachometers, selectors, encoders and transducers.
- Safety devices: overloads, circuit breakers, limit switches, terminal stopping, door protection, governors and safety gear/switches.

T4 Electrical layout/drawings and special requirements encompassing:

- Lift code and AS/NZS 3000 requirements
- specific lift symbols
- conduits
- trailing cable
- troughing
- colour coding and labelling
- segregation LV/ELV
- telephone and communication cabling
- regulatory requirements and door lock wiring.

T5 Safety drive adjustment encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Emergency stop button
- speed governor
- reverse phase protection
- broken chain/step switch
- broken main drive switch
- drive access switch
- start pressure switch and landing guards/barriers.

T6 Lift components – electronic encompassing:

- Encoders
- Transducers
- Electronic boards
- Selectors
- Rectifiers
- Capacitors
- Resistors
- Processor Board
- I/O board

T7 Drives - types, construction and operation encompassing:

- Traction
- Gearless types

  Note:

  Examples are: Speed/load characteristics, Efficiency, Application, Brakes, Electric prime mover (motor types and control)
- Geared types
- Speed/load characteristics, Efficiency, Application, Brakes, Electric prime mover (motor types and control)
- Other types of lifts (Drum, Rack and pinion, Chain, Screw)

T8 Fault finding encompassing:

- Visual inspection
- Performance checks and application of fault finding principles

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in complex lift systems as described in 8) and including:

Release passengers from a lift, which has become immobilised as specified in the performance criteria and range statement

Diagnose and repair faults in lift circuits and associated components for at least three types of lift circuits/components as follows:

A Governors.

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B Brakes.

C Safety gear.

D Safety devices.

E Lift machines.

F Door components.

G Controllers.

Replace and/or adjustment of lift equipment in at least three types of lift equipment as described below:

A Electro-hydraulic lift.

B Electric traction lift.

C Passenger lift.

D Goods lift.

And

A Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and

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replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in complex lift systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG11 6A Diagnose and rectify faults in traction lift systems

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Range Statement

RANGE STATEMENT

10) 8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to diagnosing and rectifying faults in complex lift circuits and associated components for at least three (3) types of lift equipment as listed:

- Emergency light units
- D.C. power supplies
- Variable voltage controllers
- Variable speed hoist motor control
- Variable speed door motor control
- Electronic lift controls
- Lift remote monitoring equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG169A Manage large electrical projects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the management of large electrical projects involving design, modifications, installation, and/or maintenance of systems and equipment. The unit encompasses management of safety, budget variation, personnel, resources, critical path timelines and completion documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the scope of the project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Project deliverables and budget are established from project planning and other relevant documentation and from discussions with appropriate person(s).
	1.3	Measurable outcomes are identified to evaluate the project on completion from project planning and other relevant documentation.
	1.4	Plant, materials and skills needed to meet project outcome are established from project planning and other relevant documentation.
	1.5	Processes and procedures are developed for managing contract variations from discussions with appropriate person(s) and in accordance with contractual agreement.
2 Manage project.	2.1	OHS policies, procedures and programs are implemented and monitored.
	2.2	Achievement of project outcomes is delegated to appropriately competent persons involved in the project.
	2.3	Risk events are identified and project plan strategies implemented to ensure that outcomes are achieved to the required standard of quality specified in the contract and safety required by organization’s policy.
	2.4	Procurement processes and procedures are monitored to ensure on time supply of plant and

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ELEMENT	PERFORMANCE CRITERIA	
		materials and in accordance with organisation's policy.
	2.5	Project progress is monitored against schedule, quality requirements and budget.
	2.6	Conflict issues at the work site and between stakeholders, clients and regulators are identified and managed in accordance with organisation's policy.
	2.7	Variations are managed in accordance with agreed processes and in accordance with the contract.
	2.8	Project records are maintained and progress reports written and forwarded to all appropriate person(s).
3 Complete project.	3.1	Project outcomes are reviewed against original plan, implemented risk strategies, contract variations, safety record and budget.
	3.2	Project completion acceptance is sought from appropriate person(s) and hand-over documented in accordance with organisation's policy.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and managing large electrical projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG169A Electrical project management

Evidence shall show an understanding of managing electrical projects to an extent indicated by the following aspects:

T1 Defining project parameters encompassing:

- Project scope
- Project stakeholders and clients
- Project phases and the relationship between phases
- Time requirements and limitations
- Resource requirements and limitations
- Quality requirements and limitations

T2 Time management concepts and standard practices

T3 Financial management encompassing:

- Financial management concepts
- Standard practices for managing project finances
- Project budgets
- Costs
- variations and estimations
- Invoicing against project phases/deliverables
- Acquittals and the like

T4 Quality management concepts and practices

T5 Human Resource management concepts and practices within a project

T6 Communication management concepts and practices within a project

T7 Risk management and contingencies encompassing:

- Risk management concepts
- Internal risks
- External risks
- Contingencies
- Standard practices for managing risk within a project
- Risk minimisation
- Risk removal; and the like

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REQUIRED SKILLS AND KNOWLEDGE

T8 Procurement management concepts and practices

T9 Physical Resource management concepts and practices relating to equipment, technology, information and facilities

T10 Contracts encompassing:

- Contract format
- Contract content
- Interpreting contract clauses
- Legal obligations of contract parties
- Working to contract specifications
- Documentation accompanying contracts such as schedules and the like

T11 Performance assessment and continuous improvement

T12 Engineering ethics principles

T13 Customer/Client relations encompassing:

- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T14 Electrical industry sector customs and practice encompassing:

- Equipment procurement, cost/benefit analysis and performance testing
- Typical approaches to planning and management
- Successful planning techniques
- Best practice management methods and styles

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Manage electrical projects as described in 8) and including:

A Establishing the scope of the project accurately.

B Ascertaining the input a project.

C Developing effective management processes.

D Managing resources and variations effectively.

E Resolving conflicts.

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F Adopting risk management strategies.

G Maintaining records and submitting progress reports.

H Meeting project outcomes.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to managing electrical projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

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Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to managing an industry accepted medium/large sized electrical project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG170A Plan large electrical projects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers development and documentation of large electrical project proposals, milestones and completions. The unit encompasses, establishing budgets, critical path analysis, development of workflow strategies, documenting, presenting and negotiating budgets and timelines.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to plan project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established techniques for project planning are reviewed are adopted in accordance with organisation's policies.
	1.3	The extent of the project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
2 Develop project plan proposal.	2.1	Estimated plant, material, labour and other costs are sought and obtained from appropriate person(s) in accordance with organisation's policies and procedures.
	2.2	Project budget is established from estimated plant, material, labour and other costs in accordance with organisation's policies and procedures.
	2.3	Knowledge of critical path analysis is applied to developing workflow strategies.
	2.4	Sources and availability of materials and human resources needed for the project are established in accordance with organisation's policies and procedures.
	2.5	Risk management strategies are sought and obtained for incorporating in the project plan.
	2.6	Project plan is reviewed against all inputs and adjusted to rectify any anomalies.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Project plan proposal is documented in accordance with organisation's policies and procedures.
3 Obtain approval for project plan.	3.1	Project plan is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the project plan resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
	3.3	Final project plan is documented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning large electrical projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG170A Electrical project planning

Evidence shall show an understanding of planning projects and analyzing progress to an extent indicated by the following aspects:

T1 Project planning encompassing:

T2 Purpose of project planning Evidence shall show an understanding of managing electrical projects to an extent indicated by the following aspects:

T3 Defining project parameters encompassing:

- Project scope
- Project stakeholders and clients
- Project phases and the relationship between phases
- Time requirements and limitations
- Resource requirements and limitations
- Quality requirements and limitations

T4 Time management concepts and standard practices

T5 Financial management encompassing:

- Financial management concepts
- Standard practices for managing project finances
- Project budgets
- Costs
- variations and estimations
- Invoicing against project phases/deliverables
- Acquittals and the like

T6 Quality management concepts and practices

T7 Human Resource management concepts and practices within a project

T8 Communication management concepts and practices within a project

T9 Risk management and contingencies encompassing:

- Risk management concepts
- Internal risks
- External risks

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REQUIRED SKILLS AND KNOWLEDGE

- Contingencies
- Standard practices for managing risk within a project
- Risk minimisation
- Risk removal; and the like

T10 Procurement management concepts and practices

T11 Physical Resource management concepts and practices relating to equipment, technology, information and facilities

T12 Contracts encompassing:

- Contract format
- Contract content
- Interpreting contract clauses
- Legal obligations of contract parties
- Working to contract specifications
- Documentation accompanying contracts such as schedules and the like

T13 Performance assessment and continuous improvement

T14 Engineering ethics principles

T15 Customer/Client relations encompassing:

- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T16 Electrical industry sector customs and practice encompassing:

- Equipment procurement, cost/benefit analysis and performance testing
- Typical approaches to planning and management
- Successful planning techniques
- Best practice management methods and styles
- Documents needed to plan a project
- Factors influencing sequence and restraints of project activities
- Critical path analysis covering graphical representation methods and methods of representing time/rates

T17 Critical path and project analysis encompassing:

- Purpose of critical path analysis
- Essential data
- Relational sequence of work activities
- Graphical representation methods
- Methods of representing time/rates
- Monitoring methods

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REQUIRED SKILLS AND KNOWLEDGE

T18 Electrical industry sector customs and practice encompassing:

- Equipment procurement, cost/benefit analysis and performance testing
- Typical approaches to planning and management
- Successful planning techniques
- Best practice management methods and styles

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries

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risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan electrical projects as described in 8) and including:

A Determining the project requirements accurately.

B Establishing a project budget.

C Developing effective work flow strategies.

D Documenting project plan proposal.

E Negotiating alterations to the proposed project plan successfully.

F Obtaining approval of the final plan.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to planning electrical projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to managing an industry accepted medium/large sized electrical project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG171A Install, set up and commission interval metering

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the installation, set up and commission of interval metering for measurement of energy use by consumers under choice of supplier arrangement. It encompasses working safely and to installation and set up standards, evaluating the integrity of metering wiring and earthing systems, fixing metering, making power and communication connections, setting meter parameters and completing the necessary documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 3 level or higher.

- license to practice in the workplace subject to regulations for undertaking of electrical work.

Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work

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Application of the Unit **4**)

environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment

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Prerequisite Unit(s) **2)**

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install, set up and commission interval metering.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented. (Note 1.)
	1.4	Switchboard on which the meter is to be installed is inspected and evaluated for compliance with safety and functionality standards. (Note 2)
	1.5	Approval to rectify safety and/or functionality defects of the switchboard is sought from person of higher authority in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Installation of the meter and rectification work is prepared in consultation with other effected by the work and sequenced appropriately. (Note 3)
	1.7	Material needed for the work is obtained in accordance with established procedures and checked against job requirements.
	1.8	Tools, equipment and testing devices needed to for the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Install, set up and commission interval metering.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Existing metering is checked as being isolated in strict accordance OHS requirements and procedures.
	2.4	Approved rectification work is carried out to comply with standards and in accordance with established procedures.
	2.5	Metering is installed to comply with technical standards and job specifications and requirements.
	2.6	Metering power and communication connections are made in accordance with manufacture's specifications and functional and regulatory requirements.
	2.7	Meter operating parameters are set in accordance with manufacture's specifications and functional and regulatory requirements.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person
	2.9	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures.
	2.10	Metering installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report metering installation activities.	3.1	OHS work completion risk control measures and procedures are followed and supply is reinstated to the installation.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to that the installed metering conforms to requirements.
	3.4	'As-installed' metering and rectification work is documented and appropriate persons notified in accordance with established procedures.

Note.
1. Examples of hazards likely to be encountered are asbestos reinforced switchboard panels, deteriorating switchgear and cabling and location of the switchboard.
2. Safety and functionality standards include the clear identification of switchboard components and their function, sound electrical insulation of wiring and components, sound MEN and main earth connections, fire integrity and access.
3. Preparation includes arranging for the safe isolation of the installation, access to a telecommunications connection where two-way metering is to be installed and access to a transducer connection where gas metering is to be included.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing, setting up and commissioning of interval metering.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG171A Interval metering

Evidence shall show an understanding of interval metering to an extent indicated by the following aspects:

T1 Reasons for metering and the regulated market (Regulations)

T2 Metering layouts and requirements

- purpose, types and applications.
- metering equipment.

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REQUIRED SKILLS AND KNOWLEDGE

- varying arrangements for metering and meter layouts

T3 Interval metering concepts and installation

- Meter types
- Meter construction – block diagram
- Meter functions
- Importing and exporting energy
- Classes of meters
- Single and polyphase meters
- Purpose, types and applications.
- Installation and power connection arrangements.
- Communication methods and arrangements.
- Connections for gas metering.
- Procedures for setting meter parameters.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most

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effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and set up interval metering as described in 8) and including:

    A Inspecting and evaluating safety and functionality compliance of the switchboard accurately.

    B Following established procedures to obtain approval to rectify non-compliance aspects of the switchboard.

    C Carrying out preparation work effectively.

    D Rectifying compliance defects.

    E Placing and securing metering correctly.

    F Making power and communications connections in accordance with manufacture's specifications and functional and regulatory requirements.

    G Setting meter parameters in accordance with manufacture's specifications and functional and regulatory requirements.

    H Reinstating supply to the installation safely.

    I Documenting metering and rectification work and notifying appropriate persons in accordance with established procedures.

    J Dealing with unplanned events by drawing on essential

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knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and setting up interval metering.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to the installation of at least:

- a single phase interval meter
- a two-way interval meter
- an interval meter where compliance rectification work is required

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Electrical

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UEENEEG172A Investigate and report on electrical incidents and causes

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Required Skills and Knowledge clause	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the installation, set up and commission of interval metering for measurement of energy use by consumers under choice of supplier arrangement. It encompasses working safely and to installation and set up standards, evaluating the integrity of metering wiring and earthing systems, fixing metering, making power and communication connections, setting meter parameters and completing the necessary documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 3 level or higher.

- license to practice in the workplace subject to regulations for undertaking of electrical work.

Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

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Application of the Unit **4**)

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE10	Solve problems in d.c circuits

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Prerequisite Unit(s) **2)**

4A

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install, set up and commission interval metering.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented. (Note 1.)
	1.4	Switchboard on which the meter is to be installed is inspected and evaluated for compliance with safety and functionality standards. (Note 2)
	1.5	Approval to rectify safety and/or functionality defects of the switchboard is sought from person of higher authority in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Installation of the meter and rectification work is prepared in consultation with other effected by the work and sequenced appropriately. (Note 3)
	1.7	Material needed for the work is obtained in accordance with established procedures and checked against job requirements.
	1.8	Tools, equipment and testing devices needed to for the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Install, set up and commission interval metering.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Existing metering is checked as being isolated in strict accordance OHS requirements and procedures.
	2.4	Approved rectification work is carried out to comply with standards and in accordance with established procedures.
	2.5	Metering is installed to comply with technical standards and job specifications and requirements.
	2.6	Metering power and communication connections are made in accordance with manufacture's specifications and functional and regulatory requirements.
	2.7	Meter operating parameters are set in accordance with manufacture's specifications and functional and regulatory requirements.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person
	2.9	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures.
	2.10	Metering installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report metering installation activities.	3.1	OHS work completion risk control measures and procedures are followed and supply is reinstated to the installation.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to that the installed metering conforms to requirements.
	3.4	'As-installed' metering and rectification work is documented and appropriate persons notified in accordance with established procedures.

Note.
1. Examples of hazards likely to be encountered are asbestos reinforced switchboard panels, deteriorating switchgear and cabling and location of the switchboard.
2. Safety and functionality standards include the clear identification of switchboard components and their function, sound electrical insulation of wiring and components, sound MEN and main earth connections, fire integrity and access.
3. Preparation includes arranging for the safe isolation of the installation, access to a telecommunications connection where two-way metering is to be installed and access to a transducer connection where gas metering is to be included.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing, setting up and commissioning of interval metering.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

KS01-EG172A	**Electrical incidents - investigation and reporting**

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REQUIRED SKILLS AND KNOWLEDGE

T1 Procedures and protocols for giving evidence in court encompassing:

- Process for responding to a witness summons
- Requirements for preparing to appear in court to give evidence
- Court procedures and protocols for giving evidence

T2 Procedures and processes for responding to reported electrical incidents encompassing:

- Reporting requirements of the electricity legislation for electrical accidents on customer's premises.
- Responsible for investigating electrical accidents on customer's premises.
- Reporting procedures of electrical accidents on consumer's premises and distributor's assets.
- Actions to be taken when an electrical incident causes loss of life, personal injury or property damage.
- Initial task of an investigator of an electrical incident
- Extent of evidence needed to be gathered from the site of an electrical incident

T3 Conditions and actions that could result in death, injury of property damage from an electrical cause encompassing:

- Non-compliance defects of an electrical installation
- Connection or use of unsuitable (not approved) electrical equipment and appliances.
- Failure to follow safe working procedures.
- Deliberate misuse.
- Unacceptable rise in potential of exposed and extraneous conductive parts

T4 Causes of rise in potential of exposed and extraneous conductive parts encompassing:

- High impedance in the main or service neutral conductor of an MEN system.
- Earth faults.
- High impedance in the protective earthing under fault conditions.
- Ineffective equipotential bonding under fault conditions.
- Ineffective protective device under fault conditions

T5 Effects and consequences of current through the human body

T6 Electrical sources of fire in building and premises

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REQUIRED SKILLS AND KNOWLEDGE

T7 Advance electrical testing and measuring devices encompassing:

- Test/measuring devices and their application
- Safe connection of test/measuring devices into a circuit
- Taking readings
- Storage, maintenance and care of test/measuring devices

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

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EVIDENCE GUIDE

equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and set up interval metering as described in 8) and including:

    A Inspecting and evaluating safety and functionality compliance of the switchboard accurately.

    B Following established procedures to obtain approval to rectify non-compliance aspects of the switchboard.

    C Carrying out preparation work effectively.

    D Rectifying compliance defects.

    E Placing and securing metering correctly.

    F Making power and communications connections in accordance with manufacture's specifications and functional and regulatory requirements.

    G Setting meter parameters in accordance with manufacture's specifications and functional and regulatory requirements.

    H Reinstating supply to the installation safely.

    I Documenting metering and rectification work and notifying appropriate persons in accordance with established procedures.

    J Dealing with unplanned events by drawing on essential

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knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and setting up interval metering.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to the installation of at least:

- a single phase interval meter
- a two-way interval meter
- an interval meter where compliance rectification work is required

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Electrical

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UEENEEG175A Develop compliance policies and plans to conduct a electrical contracting business

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the development of plans and policies to ensure regulatory requirements are met in conducting a contracting business, regulatory compliance, occupational and workplace relation requirements associated with functions and responsibilities of a contracting business. It encompasses applying knowledge of compliance regulations and standards, legislated obligations in relation to safety, the environment, heritage sites and employment and human resources.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop plans and compliance policies.	1.1	Factors influencing the performance of a contracting business are investigated and evaluated.
		1.2	Information and advice is sought on the effects of legislated requirements on the operation of a contracting business.
		1.3	Formal processes to meet compliance, managerial, occupational and workplace relations' obligation in a contracting business are clearly identified.
		1.4	Focus of the business is established from investigation of market opportunities and financial climate in which it is to operate
2	Develop plans and compliance policies.	2.1	Policies are established to ensure occupational aspects of work undertaken by the business met all legislated requirements and standards.
		2.2	Policies are established to ensure compliance aspects of work undertaken by the business met all legislated requirements and standards.
		2.3	Policies are established to ensure managerial and workplace relations aspects of work undertaken by the business met all legislated requirements and standards.
		2.4	Procedures and processes are developed to give effect to the established business policies including maintenance of currency in changes, developments and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Methods are incorporated in the business procedures to maintain currency with occupational, compliance, managerial and workplace relations developments.
	2.6	Policies, plans and procedures are reviewed in consultation with appropriately competent person(s) and changes made where agreed as necessary.
	2.7	Plans, policies and procedures are documented in accordance sound management practice.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing plans and compliance policies to conduct a contracting business.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG175A Electrical contracting plans and compliance policies

Evidence shall show an understanding of developing compliance policies and plans for a contracting business to an extent indicated by the following aspects:

T1 Enterprise regulatory requirements and non regulatory standards

- Compliance regulations for businesses
- Methods of meeting compliance
- Non-regulatory standards and their effects on business

T2 Electricity distributors, supply requirements

- General requirements for the supply of electricity.
- Supply and metering requirements.
- Acceptable arrangement of switchgear and controlgear.
- Acceptable earthing methods and arrangements

T3 Electricity regulatory safety requirements

- Regulatory requirements for ensuring the safety and integrity of electrical installations.
  - Regulatory requirements are relative to the jurisdiction for which competency is sought
- Types and scope of electrical inspections and safety audits
- Authority of electrical inspectors

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop plans and compliance policies to conduct a contracting business as described as described in 8) and including:

A Evaluating factors influencing the performance of a contracting business accurately.

B Identifying the formal processes for meeting legislated obligations.

C Establishing an appropriate focus for the business.

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D Establishing policies to ensure all legislated requirements and standards are met.

E Developing procedures and processes to give effect to established policies.

F Giving written justification of solutions provided.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing plans and compliance policies to conduct a contracting business.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary

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equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

Nil

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing plans and compliance policies to conduct a small electrical contracting business

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG177A Select low voltage power factor correction equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the selection (sizing) of power factor correction equipment for commercial and/or industrial installations using appropriate equipment based on the load profile of the selected installation. The correction equipment is limited to the capacitive type including control devices/systems including contactors or solid state types. It encompass safe working practices, corrective equipment for multiphase circuit arrangements and issues related to protection, including circuit problems derived from harmonic generation and resonance problems within the installation.

Application of the Unit

Application of the Unit

2)

2.1) General Application

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

2.2) Importation

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

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Licensing/Regulatory Information

License to practice **3)**

The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of electrotechnology components
UEENEEE1	Solve problems in d.c circuits

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Prerequisite Unit(s) **4)**

04A

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install wiring and accessories for low voltage circuits
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to select power factor correction equipment	1.1 The extent and nature of the electrical installation is determined from job specifications.
	1.2 Safety and other regulatory requirements to which the electrical installation shall comply are identified, obtained and understood.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Cable routes, the route lengths of cables and the conditions in which the wiring system is to operate is determined from job specifications or from consultation with appropriate persons.
2	Select power factor correction equipment	2.1	Wiring systems are selected for suitability for the environments in which they are to operate.
		2.2	Cable conductor sizes are selected to meet current-carrying capacity requirements and voltage-drop and earth fault-loop impedance limitations.
		2.3	Circuit protective devices are selected to meet requirement for co-ordination with conductor current-carrying capacity.
		2.4	Earthing system components are selected to meet requirements of an MEN system.
		2.5	Evidence is obtained that electrical equipment selected complies with safety requirements.
3	Document power factor correction equipment installation details.	3.1	Evidence is obtained from manufacturers/suppliers that electrical equipment selected complies with safety requirements.
		3.2	Reasons for selections made, including calculations, are documented in accordance with established procedures.
		3.3	Electrical installation arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of selecting power factor correction equipment for commercial/industrial electrical installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG177A Power factor correction — equipment selection

Evidence shall show an understanding of power factor correction and equipment selection to an extent indicated by the following aspects:

T1 Definitions, concept of power factor and reasons for improving power factor.

T2 Situations leading to reduction of power factor.

T3 Consequences of poor power factor encompassing:

- demand tariff costs
- non-compliance with NSP and system energy loss

T4 Design considerations encompassing:

- special conditions existing and the suitability for PFC such as existence of distortion due to electronic loads, UPS systems, power generation facilities or complex electronic loads
- load profile and the nature of the load in all operating modes and with all possible sources of supply using three phase power recorders
- power supply quality issues in terms of voltage and frequency stability
- calculation of corrective VARs
- circuit protection issues and safety
- nominal location, arrangement
- types of capacitors to be used
- use of synchronous motor for large installations
- possibility of resonance
- discharge measures
- types of PFC controls
- LV PFC; HV PFC; solid state switched

T5 Compliance with Australian Standards encompassing:

- AS1013-1971 Shunt capacitors for connection to power frequency systems
- AS/NZS 3000 Wiring Rules
- AS/NZS 3947 low voltage switchgear and Control gear

T6 Testing and commissioning of power factor equipment including controls.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment

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instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Selecting power factor correction equipment for electrical installations as described as in 8) and including:

A Determining the extent and nature of the installation from job specifications

B Obtaining and understand the safety and other regulatory

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requirements to which the electrical installation shall comply

C Determining power factor correction equipment using graphical or mathematical methods.

D Selecting wiring system suitable for the environment requirements.

E Selecting cable conductors sizes in consideration to current-carrying capacity and voltage-drop / earth fault-loop limitation.

F Ensuring co-ordination between circuit protective device and conductor current-carrying capacity.

G Selecting compliant earthing system components

H Documenting equipment and systems requirements to be used, specification for items selected and reasons for the selections made.

I Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to selecting and arranging power factor equipment for electrical installations.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

Nil

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to at least two different power factor installations as listed:

- Low voltage installation using contactor switching
- Low voltage installation using solid state switching
- High voltage installation using contactor switching
- High voltage installation using solid state switching

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG179A Develop detailed electrical drawings

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the production of detailed electrical drawings, drawing sets and documentation. It includes safe working practices; interpreting technical data and specifications; using advanced computer-aided systems and commands and appropriate drafting peripheral systems, equipment and tools to develop detailed drawings. It also includes applying knowledge of electrical equipment design drawing methods, techniques, procedures and protocols and documenting design, storing and retrieving data, and producing related documentation for presentation of preliminary and final drafts for verification.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED104A	Use software for engineering applications
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software
UEENEEE192A	Produce detailed electrotechnology/utilities drawings using computer aided design equipment and software.

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop detailed electrical drawings	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	The need for detailed electrical drawings is determined

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ELEMENT		PERFORMANCE CRITERIA	
			from the nature of the work to be undertaken.
		1.4	Established routines and procedures are followed to obtain electrical drawings details required for the work to be undertaken from project specifications.
		1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
		1.6	Software tools and equipment a needed for the work are obtained in accordance with established procedures
2	Develop detailed electrical drawings	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	The types of design detailed electrical drawings and layouts required are determined from project specifications
		2.3	Technical data of electrical system components is interpreted to determine parameters that are to be included in the detailed electrical drawings
		2.4	Appropriate software tools are used to produce detailed electrical drawings based on standard protocols
		2.5	Detailed electrical drawings are checked for accuracy are compliance with project specifications
		2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3	Complete develop detailed electrical drawings documentation	3.1	Completed detailed electrical drawings are submitted to an appropriate person to be checked for accuracy and compliance with project specifications.
		3.2	Any alterations, additions or correction instructions are followed and detailed electrical drawings are re-submitted for final approval
		3.3	Copies of completed detailed electrical drawings are filed securely in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and develop detailed electrical drawings.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG179A Electrical Detailed Drawings

Evidence shall show an understanding of electrical detailed drawings to an extent indicated by the following aspects:

T1 (Is the number correct?) Producing final drafts for verification encompassing:

- principles, purpose and concept of verification of drafting products encompassing: production of electrical drawings for verification by authorised persons, production of drawing sets, production of related documentation, presentations of final drafts
- processes and procedures related to the verification of final drafts by authorised persons encompassing: accuracy
- publication of verified electrical drawings

T2 Detailed electrical drawing production covering encompassing:

- distribution branch circuits and boards, services and load calculations; encompassing panels(HV/LV)/switch boards/motor control centres/final
- conductor/cable selection and calculations encompassing: electrical, data, communications
- overcurrent and overvoltage protection
- cable support systems; encompassing cable trays, trunking, conduits, ducts, guards, saddles, carriers, raceways/cavities, poles
- box and fitting fill requirements
- wiring devices and terminations
- distribution equipment; encompassing power circuit devices
- distribution system transformers; encompassing specialty transformers, power circuit devices
- lighting applications; encompassing lamps, ballasts, and components
- motors; encompassing functional controls, advanced motor controls, motor calculations, motor maintenance arrangements
- hazardous areas encompassing: electrical equipment; classification of
- emergency standby systems; encompassing UPS/inverter and battery banks
- fire alarm systems
- high-voltage terminations/splices
- cable size selection for installation cable run

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REQUIRED SKILLS AND KNOWLEDGE

- cable sizes, voltage drops, conduit sizes, fault levels, fuse/circuit breaker (CB) sizes and working temperatures
- short circuit calculations
- earth loop impedance compliance test arrangements on the completed design
- touch potentials calculations
- cable schedules creation
- “single line” and “as built” drawings; encompassing three phase schematic colour diagrams, marked up cable calculations, short circuit results, earth loop impedance results
- quantities parts list and drawings for tender drawings issued by electrical consultants/engineers
- coordination and discrimination studies
- Building Management Systems (BMS) encompassing: building information modelling and sustainable design
- fuse and CB trip curves plots and displays
- troubleshooting/fault finding

T3 Schematic component commands detailed encompassing:

- schematic symbols editor
- schematic editor
- components from lists
- connectors
- terminals; encompassing multiple level and jumpers
- circuits
- multiple phase circuits

T4 Schematic editing encompassing:

- advanced utilities
- copy catalogue and location
- values
- swapping and updating blocks
- using the auditing tools
- update and retag drawings

T5 Detailed panel layouts encompassing:

- detailed panel layouts creation
- din rail tool
- terminal strip editor
- detailed panel layout annotation
- detailed reports

T6 Digitising and scanning encompassing:

- drawings digitisation; encompassing tablet and software configuration, tablet and

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REQUIRED SKILLS AND KNOWLEDGE

puck, grids setup and alignment marks for various size drawings, software parameters setting, hard copy drawings digitisation to tablet parameters

- digitised drawing editor, manipulation and save
- digitise and grid setups and alignment marks on a hard copy of a large drawing (e.g. A1)
- scanning devices and peripherals setup encompassing associated software usage, save (e.g. file formats for use other software applications) and management
- drawing hard copy scan
- scanned image conversion to vector format, edit and save in file formats for use in CAD; encompassing importation of scanned images into CAD drawings in image formats for editing

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

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access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Produce detailed electrical drawings as described in 8) Range and including:

A Producing a variety of detailed electrical drawings

B Producing drawing sets

C Producing drafting documentation

D Interpreting and using technical data and specifications

E Selecting components and materials

F Using advanced computer-aided systems and commands

G Using relevant drafting peripheral systems, equipment and tools to develop detailed drawings

H Digitising and scanning drafting/drawings products

I Applying knowledge of electrical equipment design drawing methods, techniques, procedures and protocols and documenting design

J Applying knowledge related to storing and retrieving data, and producing related documentation for presentations

K Presenting preliminary and final drafts for verification

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

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Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to producing detailed electrical drawings

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units covering the use of detailed electrical drawings

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Range Statement

RANGE STATEMENT

10) 8This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing detailed electrical drawings:

- Covers detailed electrical drafting encompassing: circuit and wiring diagrams/schedules, block diagrams, schematics, panel/board layouts, assembly and installation drawings, modification drawings, and conversion between drawing types
- Australian/New Zealand standards and enterprise standards related to electrical drafting
- Components and materials from supplier/manufacturers' catalogues
- Detailed electrical drawings
- Drawing sets
- Drafting documentation
- Computer aided design systems, commands, drafting peripheral systems, equipment and tools
- Electrical equipment design drawing methods, techniques, procedures and protocols and documenting design
- Digitise and scan of drafting/drawing products
- Drafting data
- Storage and retrieval of drafting data
- Productions of related documentation for presentations
- Presentations
- Final drafts for verification

Organisational procedures for preparation and production of drawings, drawing sets, specifications, drafting documentation and operating and maintenance instructions/manuals for products and systems

Organisational procedures for processing, filing and saving all graphics, specifications, instructions and related documentation in correct format and location in accordance with work site procedures

Organisational procedures for collaborating with the client, key stakeholders and other staff in the selection of the preferred option

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG180A Develop detailed and complex drawings for electrical systems using CAD systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

Develop detailed and complex drawings for electrical systems using computer aided design (CAD) systems to meet design specification. It includes 2D and 3D drawing formats covering a representative range of electrical systems such as installations with alternative supplies, installations over 400 A per phase at low voltage and/or high voltage, single or multi tenancies, heavy plant, switchgear, protection systems, earthing, power factor correction, control equipment, and energy monitoring and management.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED104A	Use software for engineering applications
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG179A	Develop detailed electrical drawings
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software
UEENEEE192A	Produce detailed electrotechnology/utilities drawings using computer aided design equipment and software.

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop detailed and complex drawings for electrical systems	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures in preparation for the work are followed
		1.3	The need for detailed and complex electrical

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ELEMENT		PERFORMANCE CRITERIA	
			drawings is determined from the nature of the work to be undertaken.
		1.4	Established routines and procedures are followed to obtain electrical drawings details required for the work to be undertaken from project specifications.
		1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
		1.6	Software tools and equipment a needed for the work are obtained in accordance with established procedures
2	Develop detailed and complex drawings for electrical systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	The types of design detailed complex electrical drawings and layouts required are determined from project specifications for the electrical systems.
		2.3	Technical data of electrical system components is interpreted to determine parameters that are to be included in the detailed electrical drawings
		2.4	Appropriate software tools are used to produce detailed electrical drawings based on standard protocols
		2.5	Detailed complex electrical drawings are checked for accuracy are compliance with project specifications
		2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3	Complete detailed and complex drawings for electrical systems	3.1	Completed detailed complex electrical drawings are submitted to an appropriate person to be checked for accuracy and compliance with project specifications.
		3.2	Any alterations, additions or correction instructions are followed and detailed complex electrical drawings are re-submitted for final approval

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Copies of completed detailed complex electrical drawings are filed securely in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and development of detailed and complex drawings for electrical systems

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG180A Electrical Detailed/Complex Drawings

Evidence shall show an understanding of electrical detailed/complex drawings to an extent indicated by the following aspects:

T1 Advanced computer-aided drawing design (CAD) systems encompassing:

- principles, terms, symbols and conventions usage in deploying advanced commands using computer-aided drawing design, and application of related skills
- internet and/or network within CAD (e.g. team projects) usage
- 3-D assemblies creation
- solid model creation and editing
- usage of various software programs to produce a drafting product
- models demonstration an interpretation
- usage of geometry in parametric programs
- 2-D geometry form 3-D models creation
- surface and mass properties (e.g. area and perimeter) extraction
- importation and exportation of various file formats (e.g. BXF,IGES, and rost)
- customization to improve productivity
- multiple three dimensional views – encompassing setup environment on screen; top view; front and side views; three dimensional views
- movement through space – encompassing created views drawing; various planes; coordinate system relocation
- views creation – encompassing three dimensional geometric shapes; three dimensional complex views by manipulation of drawing planes and location of geometric shapes
- editor modification functions – encompassing facilitating modifications of geometric shapes to complete three dimensional complex views
- three dimensional view display – encompassing wire line; solid face – isometric, perspective, orthographic
- views storage – encompassing variety of views in assembly drawing files for plotting

T2 Computer based modelling and application systems encompassing:

- different types of 3 dimensional computer aided modelling techniques encompassing concepts, systems types, applications complexities and currency, enhanced features, and functionality; 3 dimensional wire frame modellers; surface

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REQUIRED SKILLS AND KNOWLEDGE

modellers; solids modellers; parametric modellers; feature based modellers

- software applications used in engineering design (e.g. Finite Element Analysis[FEA]), kinematics; manufacturing (e.g. numerical controlled machining, robotics, rheology); marketing (e.g. visualisation, animation); product design (e.g. visualisation, rapid prototyping); simulation (e.g. kinematics, production systems simulators); productivity enhancement tools, applications integration and commands (e.g. hot keys, macros, programming)

T3 Computer based modelling, design and drafting systems encompassing:

- 3 dimensional models creation - encompassing aspects of modelling such as model origin; direction of axes; scaling; construction methods; planning use of layers; planning detailing preparation; planning model visualisation; productivity enhancing tools; programming, macros, hot keys, advanced commands
- 3 dimensional assembly models creation – encompassing features such as item origins; direction of axes; planning standards use; library parts and user defined internal library parts; scaling; planning detailed views – sections; planning assembly visualisation
- detailed 3 dimensional models to Australian/New Zealand standards (dimensioned and annotated) drawings production and plotting from
- detailed 3 dimensional models to Australian/New Zealand standards assembly drawings production and plotting – including sectional views
- created data storage and retrieval from off-line storage media

T4 CAD modelling techniques encompassing:

- principles, terms, symbols and conventions usage in modelling encompassing: region modelling; solids modelling; wire frame as opposed to solids
- modelling types and usage
- region modelling techniques encompassing: region primitive; regions editor
- solid modelling techniques encompassing: solid primitives; solid primitives editor; region models to solid models conversions
- composite models production encompassing: composite regions; composite solids
- sectioned models production encompassing: cutting plane; cross hatching
- pre-drawn library files and primitives to produce 3D models
- third level software to produce 3D models
- mass and area properties extraction encompassing: area properties from region models
- 3D model rendering techniques encompassing: rendering types and preferences; rendering techniques such as lights, views, scenes
- various materials and surface finish options
- 3D models hard copy production
- 3D models storage in various file formats for retrieval into CAD drawings or other application software
- principles, terms, symbols and conventions usage in modelling techniques encompassing: 3 dimensional wire frame modellers; surface modellers; solids

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REQUIRED SKILLS AND KNOWLEDGE

modellers; parametric modellers; feature based modellers

- types and usage of modelling techniques
- applications software encompassing: engineering design, e.g. Finite Element Analysis (FEA), kinematics manufacturing, e.g. numerical controlled; machining, robotics, rheology; marketing, e.g. visualisation, animation product design, e.g. visualisation, rapid prototyping; simulation, e.g. kinematics, production, systems simulators

T5 Graphical engineering design techniques for products, processes, systems or services representation encompassing:

- principles, concepts and conventions of graphical design techniques for representing products, processes, systems or services
- functional operation of components/assemblies to be drawn
- surface contact or separation encompassing: type of fit; performance/operation on finish
- datum points and tolerances
- design functional specifications
- components, materials, methods and processes encompassing: range of options; choice; satisfying design specification
- graphical methods of representation encompassing: options
- graphical representation procedures for the preparation of production drawings, specifications and operating and maintenance instructions/manuals
- design impact and feedback encompassing: clients; stakeholders

T6 Managing resources - CAD encompassing:

- production related processes – encompassing costing of estimates, budget planning, labour - cost of time, subsequent cost for a given project; material cost for a given project; staff/skills selection; quality control methods
- Human Resource Management (HRM) – encompassing; HRM definition and aims, changing social environments; changing legal environments - Occupational Health and Safety (OHS); influence of changing technology - nature of work, quality of work; principles and concepts - motivational theories, human relations approach to productivity improvements, work design, industrial relations
- decision making activities – encompassing setting objectives; organising resources; achieving predetermined goals; evaluating results; the organising process - fragmentation of work processes, coordination of work processes; controlling - relationship with other management functions; resolution of problems; approaches and aids to decision making; functional solution methods – brainstorming, lateral thinking, synectics (creative thinking), group participant techniques
- decisions evaluation

T7 Managing CAD Systems encompassing:

- configuring computer systems - encompassing types of CPU and operating systems; peripheral input and output devices; importing/exporting drawing files;

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REQUIRED SKILLS AND KNOWLEDGE

communication protocol standards – hardware, software, installing with a CAD package; backup storage devices; cabling and communication for specific hardware

- management of CAD system variables and layers
- Local Area Networks (LAN) – encompassing LAN concepts and functions; hardware and software requirements; CAD for networks configuration; layout planning; software storage requirements; network to user configuration; applications operations - input and output devices; file management; security operations
- operations, coordination and control – encompassing storage devices; plotting mediums; plotter and consumables
- techniques for efficient system management – encompassing drawing project file management procedures, drawings files maintenance and recording; adoption of drawing standards; procedures for achieving and backing up; internal security system establishment

T8 Managing CAD utilities encompassing:

- text editing software – encompassing commands; menus; keystrokes; special software function keys; read; modification of help; modification of assistance screens
- procedures for creation of complex CAD menus – encompassing screen and digitising tablet menus; compile files to operate screen and tablet menus
- macro and icon files– encompassing techniques for creation; techniques for customisation
- file transfer procedures

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that

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can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated

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within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop detailed and complex drawings for electrical systems as described in 8) Range and including:

A Developing a variety of detailed and complex electrical drawings

B Producing drawing sets

C Producing drafting documentation

D Interpreting and using technical data and specifications

E Selecting components and materials

F Developing 2D and 3D computer based models using computer based modelling, design and drafting systems

G Applying graphical techniques to produce products, processes, systems or services designs representations

H Presenting designs of electrical engineering products, processes, systems or services

I Incorporating feedback into final products

J Verifying and presenting final drafts

K Managing, processing, storing and retrieving drafting data

L Using advanced computer-aided systems and commands

M Using relevant drafting peripheral systems, equipment and tools encompassing digitising and scanning equipment to develop detailed and complex drawings

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N Managing CAD systems and utilities

O Applying knowledge of complex electrical equipment design drawing methods, techniques, procedures and protocols and documenting design

P Applying knowledge related to resource requirements in CAD for electrical engineering briefs and/or specifications

Q Applying knowledge related to storing and retrieving data, and producing related documentation for presentations

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing detailed and complex drawings for electrical systems

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended

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for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units covering the development of detailed and complex drawings for electrical systems.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to development of detailed and complex drawings for electrical systems

- Covers detailed and complex drawings for electrical systems encompassing 2D and 3D drawing formats and products covering a representative range of electrical systems such as installations with alternative supplies, installations over 400 A per phase at low voltage and/or high voltage, single or multi tenancies, heavy plant, switchgear, protection systems, earthing, power factor correction, control equipment, and energy monitoring and management.
- Australian/New Zealand standards and enterprise standards related to electrical drafting
- Components and materials from supplier/manufacturers' catalogues
- Detailed and complex electrical drawings
- Drawing sets
- Drafting documentation
- Dimensions, limits and fits, tolerances and surface textures, datum references and geometry tolerances
- Electrical specifications, layouts, sketches or verbal instructions in conformance with Australian Standards, enterprise standards and/or design brief
- Master sketches methods, techniques, procedures and devices encompassing freehand sketching
- Type, form and size of materials from information, abbreviations and symbols supplied on electrical engineering drawings, briefs and/or specifications
- Specifications may be obtained from design information, customer requirements, sketches, preliminary layouts and/or field investigations
- Feedback procedures for incorporating client feedback from implementation, installation to commissioning stages into final product and selection of preferred option
- Materials and equipment used in electrical engineering applications by selecting the correct type, form and size of materials and equipment from information, abbreviations and symbols supplied on detailed electrical engineering drawings, briefs and/or specifications
- Resources required in CAD for electrical engineering briefs and/or specifications
- CAD modelling systems and techniques

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RANGE STATEMENT

- Graphical engineering design techniques for products, processes, systems or services representation
- Production processes and procedures for presentations of related design documentation, products, processes, systems or services
- Organisational procedures for preparation and production of drawings, drawing sets, specifications, drafting documentation and operating and maintenance instructions/manuals for products and systems
- Organisational procedures for processing, filing and saving all graphics, specifications, instructions and related documentation in correct format and location in accordance with work site procedures
- Organisational procedures for collaborating with the client, stakeholders and other staff in the selection of the preferred option
- Verification and production of final drafts processes and procedures
- Computer aided design systems, management, resources, utilities, advanced commands, drafting peripheral systems, equipment and tools encompassing digitising and scanning equipment
- Integrated and complex electrical equipment design drawing methods, techniques, procedures and protocols and documenting design
- Drafting data
- Management, storage and retrieval of drafting data.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG181A Provide advice on effective and energy efficient lighting products

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers advising customers of effective and energy efficient lighting products within the scope of manufacturers' product data. It encompasses a basic knowledge of lighting principles, light source types and typical applications and interpreting manufacturers' technical data and documenting advice given.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies need to effectively respond to inquiries in the retail and wholesale lighting sectors

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide advice on lighting products	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Appropriate questioning and active listening are used, drawing on basic knowledge of lighting to determine the nature of the enquiry.
	1.3	Lighting documentations/files that will assist in providing the necessary advice are reviewed and understood
2 Provide advice on lighting products	2.1	OHS risk control work measures and procedures are followed.
	2.2	Basic knowledge of lighting and manufacturers' data is applied to provide the necessary advice.
	2.3	Higher technical or costing inquiries are referred to an appropriate person of higher authority.
	2.4	Inquiries and how they where responded to are documented in accordance with routine procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that a basic knowledge has been acquired of lighting, light sources and luminaries.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EG181A Illumination and lighting principles

Evidence shall show an understanding of illumination and lighting principles to an extent indicated by the following aspects:

T1 Technology of light encompassing:

- Electromagnetic spectrum and visible (frequency/wave length) range
- Light output from a source (luminous flux), efficacy of different types of lamps and terms, units and symbols used.
- Light intensity — definition, terms, units, symbols and relationship with luminous flux
- Illuminance — definition, terms, unit, symbol and relationship with luminous flux and environmental factors
- Significance of inverse square law on illuminance
- Luminance — definition, term, unit, symbol and relationship with luminous intensity and illuminance
- Vision and illuminance standards for particular environments and activities

T2 Nature of light encompassing:

- Primary and additive colours
- Frequency and colour that light is perceived
- Comparison of the colour spectrum of sunlight and light generated from different lamp types.
- Colour temperature scale and the perceived colour of a light source
- Colour rendering and colour distortion.

T3 Incandescent lamp encompassing:

- Types and principles
- Features — envelope, filament type and temperature (K), fill gas, cap and common power ratings
- Effect of filament evaporation over time
- Effect on parameters (ϕ, η, P, hr) with variations in rated voltage
- Application and future

T4 Fluorescent lamps encompassing:

- Type T series — basic principle, double and single phosphor coating and CRI;

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REQUIRED SKILLS AND KNOWLEDGE

expectations (efficacy [l/w]; visual ambience [K]; visual satisfaction [CRI]; life [hr])

- Type T accessories — basic operation of electromagnetic ballast; starter; capacitor; features and advantage of electronic ballast.
- Compact fluorescent (CFL) types — integrated and non-integrated ballasts; form; rating for equivalent light out of GLS lamp;
- Application and future

T5 High intensity discharge (HID) lamps encompassing:

- Mercury lamp — types (blended light lamps and high pressure (HP) lamp), structural features, spectral intensity and CRI
- Metal halide lamp — principles, structural features, lamp forms, spectral intensity and CRI
- Application and future

T6 LED lamps encompassing:

- Types, structural features, spectral intensity and CRI
- Application and future

T7 Luminaires (Light fittings) encompassing:

- Mechanical function and components (include ingress protection rated enclosure with suitable mounting arrangement; mechanisms to accommodate lamp(s), electrical ancillaries when needed; optical system and excessive temperature rise).
- Ingress Protection (IP) ratings and examples of their application to luminaires
- Electrical function and components (Electrical components must be appropriate for the insulation class or ELV fault protection and include supply terminals; lamp holder(s); electrical ancillaries when needed; and appropriated nternal wiring).
- Optical function and components (Optical components include a variety of mechanism to: distribute light, direct light, filter light and/or limit glare; and achieve maximum possible light output ratio).
- Light output ratio of common typical luminaire without and with reflector and diffuser mechanisms.
- Light distribution and reading a polar luminance distribution curve.
- Classification of light distribution and beam spreadTypes and features of indoor luminaires (Features include light distribution, symmetry, screening and utilisation factor)
- Types and features of outdoor luminaires (Features include types of light distribution and reflector control)
- Examples of currently available luminaires for indoor and outdoor applications.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Providing advice on lighting products as described in 8) and including:

A Determining the nature of the advice required

B Reviewing appropriate lighting documentation and providing appropriate advice

C Applying basic knowledge of lighting to providing relevant advice

D Referring high technical and costing inquiries to an

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appropriate person.

E Documenting inquiries and responses in accordance with routine procedures.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing advice on effective and energy efficient lighting products.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by providing advice on lighting products for each of the following groups:

Group A	Lamp types
At least three of those listed	Incandescent lamp types
	Fluorescent lamp types
	Discharge lamps
	LED lamp types
	Ancillary apparatus

Group B	Luminaires
At least three of those listed	Optical functions and fitting design
	Light distribution
	Mounting techniques
	Modern technology applied to luminaries
	Luminaires for indoor and outdoor use

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG182A Supply effective and efficient lighting products for domestic and small commercial applications

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers responding to customer request for the supply of effective and efficient luminaries and associated control and mounting apparatus. It encompasses working safely, a knowledge of luminaries, their application and parameters, energy efficiency and safety compliance requirements and regulations, interrogating customer requests, extracting information from manufacturer's catalogues and technical data and supplying the most appropriate and compliant fittings.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies in retail or public accessible wholesale selling and confined to domestic lighting and small commercial products.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEG181A Provide advice on lighting products

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Engage with customer	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Communication with customers is conducted in a professional and courteous manner according to established procedures.
	1.3	Customer enquiries are responded to promptly and politely and in accordance with established procedures.
	1.4	Appropriate interpersonal skills are used to facilitate accurate and relevant exchange of information.
2 Clarify customer requests	2.1	Appropriate questioning and active listening are used to determine customer needs.
	2.2	Customer requests are interrogated to clearly ascertain the most suitable lighting products.
	2.3	Customers are advised of the technical and compliance aspects that need to be consider when choosing lighting products.
	2.4	Customers are provided with information about available options and assisted to identify their preferred option.
	2.5	Personal limitations in addressing customer requests are identified and where necessary assistance is sought from appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA
3 Supply lighting products	3.1 Lighting produces are supply as agreed with the customer and in accordance with established policy and procedures.
	3.2 Own work is monitored and adjusted according to requirements for job quality, customer service and efficient resource use.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of engaging with customers to supply appropriate lighting products for domestic applications.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG182A Lighting applications for domestic and small commercial premises

Evidence shall show an understanding of lighting applications for domestic and small commercial premises to an extent indicated by the following aspects:

T1 Dealing with customer requests.

T2 Extracting information from manufacturers' catalogues and other technical data.

T3 Lighting and energy conservation

T4 Lamp types where colour is important for functional or safety reasons

T5 Luminaire types where glare or illumination level gradients may cause difficulty for vision or introduce safety problems

T6 Regulatory requirements encompassing:

- BCA requirements for lighting energy input/ metre2 for domestic dwellings
- State based energy sustainability requirements (e.g. BASIX in NSW)
- Compliance requirements and marking (as per AS/NZS 4417) of products
- Electrical installation work to be carried out/supervised by a licensed electrician under a licensed electrical contractor.

T7 Criteria for recommending the most appropriate light fittings (luminaires).

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Engaging with customers to supply appropriate lighting products for domestic applications as described in 8) and including:

A Communication with customers in a professional manner and responding promptly to enquiries

B Clearly ascertain the most suitable lighting products.

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C	Advising customers of technical and compliance aspects that need to be considered when choosing lighting products.
D	Providing customers with information about available options and assisted to identify their preferred option.
E	Supplying lighting produces as agreed with the customer and in accordance with established policy and procedures.
F	Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to supplying effective and efficient lighting products for domestic and small commercial applications

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

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Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in engaging with customers to supplying lighting products for each of the following groups:

Group A	Domestic
At least one	A new three bedroom domestic dwelling, An addition/renovation of an indoor/outdoor entertainment and garden area to an existing domestic dwelling,
Group B	Small commercial
At least one	A commercial building of less than 200 m2, half on which will be used as a small appliance service area. A café or restaurant having a kitchen, rest-room and dining areas A small medical centre having a doctor's surgery, preparation room, waiting room, service desk and a bathroom and kitchen facilities

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG183A Provide advice on the application of energy efficient lighting for ambient and aesthetic effect

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers advising customers on energy efficient lighting for ambient and aesthetic effects. It encompasses a basic knowledge of lighting principles, light source types, effects of colour, visual perception and interpreting manufacturers' technical data and documenting advice given.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies needed to effectively respond to inquiries in the retail and wholesale lighting sectors.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit has been confirmed.

UEENEG181A	Provide advice on lighting products
UEENEEG182A	Engage with customers to supply lighting products for domestic and small commercial applications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide advice on lighting products	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Appropriate questioning and active listening are used, drawing on basic knowledge of lighting to determine the nature of the enquiry.
	1.3	Lighting documentations/files that will assist in providing the necessary advice are reviewed and understood
2 Provide advice on lighting products	2.1	OHS risk control work measures and procedures are followed.
	2.2	Basic knowledge of lighting, colour, CRI and creation of ‘effects’ is applied to providing the necessary advice.
	2.3	Higher technical or costing inquiries are referred to an appropriate person of higher authority.
	2.4	Inquiries and how they where responded to are documented in accordance with routine procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that a basic knowledge has been acquired of lighting, light sources and luminaries.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EG183A Lighting effects

Evidence shall show an understanding of lighting effects to an extent indicated by the following aspects:

T1 Colour of light sources

T2 Colour rendering index

T3 Effects of surface texture

T4 Visual perception

T5 Effects of indirect light encompassing:

- pelmet lighting
- reflected light

T6 Diffused light

T7 Psychology of lighting, perception and mood encompassing:

- colour temperature
- space and confinement

T8 Function of ambience

T9 Control of lighting levels encompassing:

- use of electrical or electronic control
- use of natural (daylight) lighting control

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Providing advice on the application of lighting for ambient and aesthetic effect as described in 8) and including:

A Determining the nature of the advice required

B Reviewing appropriate lighting documentation and providing appropriate advice

C Applying basic knowledge of lighting effects to provide relevant advice

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D

Referring high technical and costing inquiries to an appropriate person.

E Documenting inquiries and responses in accordance with routine procedures.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing advice on the application of energy efficient lighting for ambient and aesthetic effect.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in providing the accurate and clear advice on lighting with respect to at least three of the following;

- A home theatre
- Hotel and club dining rooms
- Domestic entertainment areas
- A semi-covered alfresco dining area
- A lobby and gathering area
- Special requirements for a reception centre

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG184A Provide photometric data for illumination system design

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the provision of photometric data to support illumination system designs. It encompasses working safely, applying knowledge of photometric, calculations for the selecting and arranging light sources for particular applications, recognising the visual requirements of the human subject, complying with standards and documenting justification for the data provided.

Application of the Unit

Application of the Unit **2)**

This unit is intended as a foundational competency underpinning further advanced competencies in the application of illumination principles and luminary's layout and design.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide photometric data	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	The required illumination parameters of the design are obtained from a design brief, job specification or by consultation with the client.
	1.3	Compliance and recommended illumination parameters for particular situations and tasks are obtained and understood.
	1.4	Lighting manufacturers' technical information for products under consideration are obtained and understood
2 Provide photometric data	2.1	OHS risk control work measures and procedures are followed.
	2.2	Photometric principles are applied to calculating photometric data required for particular applications and variety of appropriate lighting products.
	2.3	Data includes illumination compliance requirements and recommendations given in standards.
	2.4	Data is documented, including justification for conclusion, in accordance with established procedures.
	2.5	Photometric data is forwarded to appropriate personnel in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of providing photometric data for illumination system design.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG184A Photometric principles, vision and colour

Evidence shall show an understanding of photometry, vision and colour to an extent indicated by the following aspects

T1 Nature of light encompassing:

- dual nature of light electromagnetic spectrum
- frequency and wavelength (nm)

T2 Photometric principles and definitions encompassing:

- scope and definitions from AS/NZS 1680.1 and AS ISO 1000 - 1998
- luminous flux, definition and unit of measurement
- luminous intensity, definition and SI unit of measurement
- radians and steradians
- illuminance and luminance
- basic optics, reflection, refraction
- reflectance and transmittance
- diffuse surfaces
- the point source and the inverse square law
- cosine law
- relationship between watts and lumens
- older imperial measurements (These older units may include the footcandle or lumen per square foot, candlepower etc).

T3 Physiology of the eye and light detection encompassing:

- Scotopic, mesopic and photopic vision
- contrast sensitivity
- colour vision – rods and cones
- light levels and recognition of colour
- adaptation
- accommodation and visual acuity
- brightness and lightness
- image detection
- glare and comfort
- cognition and visual perception

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REQUIRED SKILLS AND KNOWLEDGE

T4 Colour encompassing:

- Munsell and CIE Colour System
- chromaticity coordinates
- black body radiation and colour temperature
- uniform chromaticity scale diagrams
- factors determining colour appearance

T5 Photometry encompassing:

- the integrating sphere
- distribution photometry
- selected requirements of AS1680.3 (Measurement, calculation and presentation of photometric data)
- the goniophotometer
- measurement of luminous flux
- measurement of luminance and cut-off angle
- measurement of illuminance (single luminaire)
- graphical representation of photometric data
- test reports and data presentation
- lux meters and measuring equipment
- required light levels for various situations as per Australian/New Zealand Standards

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment

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intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Providing photometric data for illumination system design as described in 8) and including:

A Obtaining illumination parameters from a design brief, job specification or by consultation with the client.

B Understanding compliance and recommended illumination parameters for particular situations and tasks.

C Understanding manufacturers' technical information.

D Documenting photometric data including justification for conclusions

E Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

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Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing photometric data for illumination system design.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to at least three of the following:

- Determination of lighting levels for specific situations
- Interpretation of manufacturers' photometric data
- Determination of lighting level transitions where safety is a consideration
- Calculations using the inverse square law
- Measurement of lighting levels using a light (lux) meter
- Presentation of a simple photometric report
- Present a report (lighting levels) on an existing installation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG185A Select effective and efficient light sources and luminaries for given locations and designs

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the selecting effective and efficient light sources and luminaries for a given location and lighting design. It encompasses, applying knowledge of light sources and luminaries and given lighting design parameters, complying with standards and documenting justification for the selections made.

Application of the Unit

Application of the Unit **2)**

This competency standard unit, together with its pre-requisite provides the foundation for specific application competencies in a number of areas.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG184A	Provide photometric data for illumination system design

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to select light sources and luminaries	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	The parameters of the lighting design are obtained from a design brief, job specification or by consultation with the client.
	1.3	Compliance and recommended illumination parameters for particular situations and tasks are obtained and understood.
	1.4	Lighting manufacturers' technical information for products under consideration are obtained and understood
2 Select light sources and luminaries	2.1	OHS risk control work measures and procedures are followed.
	2.2	Knowledge of light sources and luminaries are applied to selecting light sources and luminaries appropriate to given lighting design parameters.
	2.3	Selected light sources and luminaries are within the illumination compliance requirements and standards for the given design.
	2.4	Selected light sources and luminaries are documented, including justification for conclusion, in accordance with established procedures.
	2.5	Documentation of the selected light sources and luminaries is forwarded to appropriate personnel in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of providing photometric data for illumination system design.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies..

KS01-EG185A Light sources and luminaries

Evidence shall show an understanding of light sources, lamps and luminaires to an extent indicated by the following aspects:

T1 Types of light sources and their historic development including the practical requirements, advantages and disadvantages of light sources encompassing:

- incandescent
- electrical discharge in gases
- tubular fluorescent
- compact fluorescent types
- phosphor types
- low pressure sodium
- high pressure sodium
- metal halide
- mercury vapour
- tungsten halogen cycle lamps
- neon and advertising tube types
- LED technologies

T2 Each practical lamp type is designated in terms encompassing:

- luminous efficacy
- spectral output
- colour rendering
- longevity of operation
- supply requirements and control equipment
- cost
- sustainability and recycling

T3 Types of luminaire encompassing:

- general design and types
- provision of data on luminaires
- methods of light control
- properties of optical systems: refractors, reflectors, diffusers
- luminance control techniques

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REQUIRED SKILLS AND KNOWLEDGE

- luminaires and auxiliaries
- Australian Standards for indoor and outdoor luminaires
- calculation of utilisation factors
- provision of photometric data
- luminance of various fittings

T4 Natural lighting and building design

T5 Techniques used to minimise energy expenditure

T6 Specific application lamps

- specific task lamps
- germicidal lamps
- indoor agricultural or hydroponic lamps

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

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various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Providing photometric data for illumination system design as described in 8) and including:

A Obtaining illumination parameters from a design brief, job specification or by consultation with the client.

B Understanding compliance and recommended illumination parameters for particular situations and tasks.

C Understanding manufacturers' technical information.

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D Selecting appropriate light sources and luminaries

E Documenting selected light sources and luminaries including justification for the selections made

F Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

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The resources used for assessment should reflect current industry practices in relation to selecting effective and efficient light sources and luminaries for given locations and designs.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to at least three of the following:

- An application using incandescent lamps for colour rendition
- Outside security lighting
- A high bay application
- Highway lighting
- Store/shop lighting
- A school or training classroom
- Localised task lighting
- A flood-lighting application
- A situation integrating some natural daylight

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG186A Design effective and efficient lighting for residential and commercial buildings

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers lighting design for residential and commercial buildings to provide sufficient illumination with minimal energy use. It encompasses an understanding of safety principles and photometrics, the application of design calculations, compliance standards, energy management, lighting control and available lighting products appropriate to the illumination design and fully documenting completed design.

Application of the Unit

Application of the Unit **2)**

This unit is intended to focus the competencies obtained as prerequisites to the specific application of lighting design in various situations in terms of effectiveness and efficiency.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and

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License to practice **3)**

safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG184A	Provide photometric data for illumination system design
UEENEG185A	Select effective and efficient light sources and luminaries for given locations and designs.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design lighting	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
		1.2	The extent and nature of the lighting requirements is determined from design brief.
		1.3	Safety and other regulatory requirements to which the lighting design shall comply are identified, obtained and understood. Note. Requirements include performance standards set down by the BCA for various types of building classifications
		1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the lighting installation or associated work.
2	Develop lighting design.	2.1	Knowledge of lighting performance standards, compliance methods and lighting equipment is applied to designing the lighting.
		2.2	Alternative arrangements for the lighting design are considered based on the requirements outlined in the design brief.
		2.3	Safety, functional and budgetary considerations are incorporated in the lighting design.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Lighting design draft is checked for compliance with the design brief and regulatory requirements.
	2.5	Lighting design is documented for submission to appropriate person(s) for acceptance and approval.
	2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3 Obtain approval for lighting design.	3.1	Lighting design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of designing effective and efficient lighting for residential and commercial buildings.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG186A Lighting design

Evidence shall show an understanding of lighting design to an extent indicated by the following aspects:

T1 Detailed knowledge of lighting principles

T2 Lighting applications

T3 Safety aspects of lighting

T4 Energy efficiency

T5 Integrating various lighting types into one application

T6 Control and energy management

T7 Interpreting and applying manufacturers' technical data

T8 Architectural considerations

T9 Utilising natural lighting

T10 Use of computer programs for lighting design

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Designing effective and efficient lighting for residential and commercial buildings as described in 8) and including:

A Determining the extent and nature of the lighting requirements from a design brief.

B Identifying and understanding safety and other requirements to which the lighting design shall comply.

C Planning to meet scheduled timelines

D Applying appropriate knowledge of lighting performance

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compliance and lighting equipment in designing the lighting.

E Considering alternative arrangements for the lighting design

F Including safety, functional, maintenance and budgetary factors in the lighting design

G Documenting and presenting the lighting design

H Responding appropriately to requests to alter the design.

I Documenting and obtaining approval of the lighting design.

J Dealing appropriately with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing effective and efficient lighting for residential and commercial buildings.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is

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expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to at least three of the following:

- Large residential lighting design
- Indoor area shop lighting
- Stairway or stairwell lighting
- Flood lighting
- Amenities lighting
- Lighting for specific commercial processes and tasks
- Lighting for ambient and aesthetic effect
- Display lighting
- Security lighting
- Using computer program for lighting design

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG187A Design effective and efficient lighting for public, open and sports areas

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers effective and efficient lighting design for public and open areas, such as indoor and outdoor sporting facilities, urban parks and the like, to provide sufficient illumination with minimal energy use. It encompasses an understanding of safety principles and photometrics, the application of design calculations, compliance standards, energy management, lighting control and available lighting products appropriate to the illumination design and fully documenting completed design.

Application of the Unit

Application of the Unit

2)

This unit is intended to focus the competencies obtained as prerequisites to the specific application of lighting design in public areas and sporting applications in terms of effectiveness and efficiency.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the

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License to practice **3)**

workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG184A	Provide photometric data for illumination system design
UEENEG185A	Select effective and efficient light sources and luminaries for given locations and designs.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills **5)**

will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design lighting public, open and sports areas	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent and nature of the lighting requirements is determined from design brief.
	1.3	Safety and other requirements to which the lighting design shall comply are identified, obtained and understood. Note. Requirements include performance standards set down by the BCA for various types of building classifications
	1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the lighting installation or associated work.
2 Develop lighting design.	2.1	Knowledge of lighting performance standards, compliance methods and lighting equipment is applied to designing the lighting.
	2.2	Alternative arrangements for the lighting design are considered based on the requirements outlined in the design brief.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Safety, functional, maintenance and budgetary considerations are incorporated in the lighting design.
	2.4	Lighting design draft is checked for compliance with the design brief and regulatory requirements.
	2.5	Lighting design is documented for submission to appropriate person(s) for acceptance and approval.
	2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3 Obtain approval for lighting design.	3.1	Lighting design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of designing lighting for public, open and sports areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG187A Open area and sports lighting

Evidence shall show an understanding of lighting design for outdoor and sports application lighting to an extent indicated by the following aspects:

T1 Reasons for quality lighting in sport

T2 Key terms in sports lighting encompassing:

- Quantity of light required
- Horizontal luminance
- Vertical illuminance
- Illuminance uniformity
- Uniformity gradient
- Modelling and shadows
- Colour rendering
- Colour temperature
- Glare
- Emergency escape lighting
- Switching mode
- Emergency (continuity) TV lighting
- Obtrusive light

T3 The sports lighting design process encompassing:

- Project definition
- Lighting study
- Questions for indoor and outdoor venues
- Lamp selection
- Luminaire selection
- Arrangement of luminaires
- Cost of ownership
- Installation
- Aiming, measuring and commissioning
- Maintenance

T4 Layout for lighting in multi-purpose halls and enclosed areas

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REQUIRED SKILLS AND KNOWLEDGE

T5 Sports grounds and stadiums

- Lighting configuration
- Sports grounds with no spectator stand
- Sports grounds and stadiums with a spectator stand

T6 Swimming/diving

T7 Other considerations

- Theatrical lighting effects and dynamic lighting

T8 Recommendations

- Recommendations for non-televised events
- Classes of play
- Recommendations for televised events

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

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various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be

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required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - designing lighting for public, open and sports areas as described in 8) and including:

A Determining the extent and nature of the lighting requirements from a design brief.

B Identifying and understanding safety and other requirements to which the lighting design shall comply.

C Planning to meet scheduled timelines

D Applying appropriate knowledge of lighting performance compliance and lighting equipment in designing the lighting.

E Considering alternative arrangements for the lighting design

F Including safety, functional, maintenance and budgetary factors in the lighting design

G Documenting and presenting the lighting design

H Responding appropriately to requests to alter the design.

I Documenting and obtaining approval of the lighting design.

J Dealing appropriately with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing effective and efficient lighting for public, open and sports areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to at least three of the following

- Flood lighting of tennis courts
- Flood lighting of netball or basketball courts
- Flood lighting of football grounds
- Lighting of squash courts
- Lighting of indoor or outdoor bowling greens
- Swimming pool lighting
- Sporting spectator lighting
- Other sporting applications
- Stair lighting / passageway lighting
- Park lighting
- Mall lighting
- Car park lighting

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UEENEEG188A Prepare quotations for the supply of effective and efficient lighting products for lighting projects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers preparing quotations for supply of effective and efficient lighting products based on given specifications and/or material schedules. It encompasses knowledge of lighting and ancillary components, their application and parameters, compliance requirements, installations conditions, interpreting manufacturer's technical data, job specifications and equipment schedules and documenting quotations accurately.

Application of the Unit

Application of the Unit **2)**

This unit is intended to complement the other application units relating to the design of lighting installations.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG184A	Provide photometric data for illumination system design
UEENEG185A	Select light sources and luminaries for given locations and designs.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the extent of lighting products to be supplies.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed
	1.3	The scope of lighting products required is determined from job specifications and discussions with customer and/or other appropriate person(s)
	1.4	The level of service on which a quotation is to be given is documented as a job specification and agreement sought with customer or other appropriate person(s)
	1.5	OHS and other regulatory and compliance requirements are incorporated in the work on which the quotation is based.
	1.6	Timelines for the submission of the quotation are established with the customer and/or other appropriate person.
2 Develop quotations.	2.1	Lighting products and related material take-offs are performed accurately and checked against job specification.
	2.2	Lighting products are selected to meet performance requirements of a formal job specification
	2.3	Calculations are applied to selecting the type and quantity of lighting products to be included in the quotation.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Item costs are determined from, enterprise costing policy and procedures.
	2.5	Quotations are checked for accuracy in costing and against job specification
3 Document and submit quotation.	3.1	Quotation is documented in accordance with established policies and procedures
	3.2	Quotation is submitted to customer within by an agreed date

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of preparing quotations for the supply of products for lighting projects

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG188A Lighting products — quotation preparation

Evidence shall show an understanding of quotation preparation for lighting products to an extent indicated by the following aspects:

T1 Knowledge of lighting products

T2 Illumination principles

T3 Lighting applications

T4 Lighting product parameters

T5 Compliance requirements

T6 Installation conditions

T7 Interpreting manufacturers technical data,

T8 Interpreting job specifications

T9 Interpreting equipment schedules

T10 Documenting quotations

T11 Use of computer program for quoting purposes

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Preparing quotations for the supply of products for lighting projects as described in 8) and including:

A Determining the scope of lighting products required from job specifications and discussions with customer and/or other appropriate person(s

B Documenting the compliance requirements and level of service on which the quotation is to be given

C Establishing timelines for submission of the quotation

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D Performing material take-offs accurately

E Applying calculation to selecting appropriate type and quantity of lighting products

F Determined item costs from enterprise costing policy and procedures.

G Check quotation against item costs and job specifications.

H Documenting quotation accurately and submitting it on time.

I Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to prepare quotations for the supply of effective and efficient lighting products for lighting projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires

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that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in preparing quotation for the supply of lighting products with a quotation value in excess of $10,000 including at least three of the following :

Group A At least three of the listed types on at least three occasions	Luminaries types High efficiency troffer fitting High bay fittings Compact floodlamps Energy efficient halogen downlights Compact fluorescent downlights Diffused fluorescent fittings Note: a combination of the above luminaries types may be included in the quotations for a given installation
Group B At least two	Applications Large residential lighting design Store/shop lighting Shopping centre general lighting Security lighting Car park lighting

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG189A Install and maintain emergency lighting systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the installation and maintenance of emergency exit lighting systems in buildings and premises. It encompasses working safely and to installation and maintenance standards, complying with maintenance schedules and completing the necessary documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

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License to practice **3)**

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits

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Prerequisite Unit(s) **4)**

UEENEEG102A	Solve problems in low voltage a.c. circuit
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and maintain emergency systems	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Installation/maintenance is prepared in consultation with other affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or appropriate person to establish the scope of work to be undertaken.
	1.6	Location of apparatus and associated equipment is planned within the constraints of the building structure, significants and regulations.
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
	1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.

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ELEMENT	PERFORMANCE CRITERIA	
	1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.10	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2 Install and maintain emergency systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Apparatus and associated equipment are installed and maintained to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance.
	2.5	Wiring is terminated at apparatus and associated equipment in accordance with manufacture's specifications and functional and regulatory requirements.
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures.
	2.9	Apparatus installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable

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ELEMENT	PERFORMANCE CRITERIA	
		energy principles.
3 Completion and report installation and maintenance activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to that the installed and maintained apparatus conforms to requirements.
	3.4	'As-installed' emergency systems apparatus and associated equipment is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining emergency systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG189A Safety service — emergency lighting installation and maintenance

Evidence shall show an understanding of emergency lighting installation and maintenance to an extent indicated by the following aspects:

T1 Emergency lighting luminaires and exit signs

T2 Emergency lighting control systems including wired and wireless control.

T3 Arrangements and control encompassing:

- Labelling of devices operation of emergency lighting

T4 Emergency power supplies for centrally supplied systems encompassing:

- emergency power source
- batteries and their installation
- battery charger assembly
- inverters
- alarm systems

T5 Design of emergency escape luminaire installation encompassing:

- provision of emergency luminaires
- acceptable emergency escape luminaires
- installations employing direct lighting
- installations employing indirect lighting
- lighting of stairways
- identification and marking of emergency escape luminaires

T6 Installation of electrical wiring and equipment for centrally supplied systems encompassing:

- circuit voltage drop
- protection against overcurrent
- protection of the electrical installation against fire
- segregation or identification of submains
- arrangement of final subcircuits

T7 Particular requirements for self-contained emergency escape luminaires and

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REQUIRED SKILLS AND KNOWLEDGE

exit signs encompassing:

- suitability for operating temperatures
- arrangement and control
- batteries
- battery chargers
- control equipment
- electrical requirements
- self-contained automatic discharge testing facilities

T8 Battery systems used in emergency lighting encompassing:

- Types of batteries and their characteristics
- Recharging arrangements
- Procedures for testing emergency lighting

T9 Maintenance and inspection requirements encompassing:

- Compliance standards include AS/NZS2293 series and Building Code of Australia (BCA)
- information required for maintaining the system
- operating and maintenance manual
- provision for the recording of maintenance

T10 Inspection and maintenance procedures for central systems encompassing:

- required procedures.
- six-monthly procedures
- twelve-monthly procedures

T11 Inspection and maintenance procedures for single-point systems encompassing:

- required procedures
- six-monthly procedures
- twelve-monthly procedures
- battery replacement
- cleaning of emergency luminaires

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain emergency lighting systems as described in 8) and including:

A Determining the operating parameters of existing electrical systems.

B Using established problem solving methods.

C Directing personnel to take relevant measurements.

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D	Interpreting measured values appropriately.
E	Providing effective solutions to electrical system problems.
F	Giving written justification of solutions provided.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and maintaining emergency lighting systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

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assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG103A	Install wiring and accessories for low voltage circuits
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing and maintaining emergency lighting systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG197A Apply currency of safe working practices and compliance verification of electrical installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers current practices in working safely and verifying compliance of electrical installations that affect the currency of competencies held. It encompasses working safely, procedures for rescue from contact with live parts and for applying emergency first aid. It also encompasses current practices in visual inspections and mandatory compliance testing, identifying non-compliance defects and mandatory reporting requirements.

Application of the Unit

Application of the Unit

2)

2.1) General Application

The licensing regulator may require a holder of ‘Unrestricted Electrician’s Licence’ or ‘Qualified Electrical Contracting Licence’ to undertake this unit periodically to demonstrate currency in safe working, electrical rescue practices and compliance verification of electrical installations.

2.2) Electrical Contractors

A ‘licensed electrician’ applying for an ‘electrical contractors licence’ may be required to undertake this unit to demonstrate their currency with verification of compliance requirements. In this case they are deemed to have met the prerequisites for this unit provided that:

hold a current ‘Unrestricted Electrician’s Licence’ issued

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in an Australian State or Territory.

have recently been in permanent employment as a licensed electrician.

Licensing/Regulatory Information

License to practice **3)**

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Competency in this unit can only be gained by persons who hold a current 'Unrestricted Electrician's Licence' issued in an Australian State or Territory.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to enter a work area and verify compliance of an electrical installation	1.1	Work area access permits are obtained from appropriate personnel according to established procedures
		1.2	Safe work methods for controlling risk obtained, read and understood prior to undertaking a work activity.
		1.3.	Preparations for electrical and non-electrical isolation are carried out to prevent creation of hazards from loss of machine/system/process control according to established procedures.
		1.4	Documentation or deemed to comply standard on which installation is based is reviewed and understood.
		1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
		1.6	Tools and equipment needed for the work are checked for safety and correct functionality according to

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ELEMENT	PERFORMANCE CRITERIA	
		established procedures and regulatory requirements.
2. Follow workplace procedures for hazard identification and risk control	2.1	Hazards are identified and control measures implemented and monitored through active participation in the consultation process with employer and other employees.
	2.2	Hazards in the work area are recognised and reported to appropriate personnel according to established procedures.
	2.3	OHS records of incidents are completed in accordance with regulatory requirements and established procedures.
	2.4	Workplace instructions and training are followed accurately within established procedures.
3 Apply safe working practices to verifying compliance of an electrical installation	3.1	Safe work methods for controlling risk are followed accurately.
	3.2	Workplace procedures for dealing with accidents, fires and emergencies are followed according to work procedures and scope of responsibility and competencies.
	3.3	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	3.4	Compliance of the electrical equipment and as it is installed is ascertained by visual inspection in accordance with current standards and regulatory requirements.
	3.5	Mandatory tests are conducted to ascertain the compliance of the safety parameters of installed circuits, switchgear, protection and earthing in accordance with current standards and regulatory requirements.
4 Report compliance findings.	4.1	OHS risk control work completion measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	4.3	Non-compliance defects are identified and reported in accordance with current standards and regulatory requirements.
	4.4	Recommendations for rectifying defects are made in accordance with established procedures.
	4.5	Mandatory documentation is completed in accordance with current standards and regulatory requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of preparing quotations for the supply of products for lighting projects

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG197A Current requirements of safe working practices

Evidence shall show an understanding of current requirements of working place health and safety to an extent indicated by the following aspects.

T1 The current legal requirements covering workplace health and safety in the workplace.

T2 The current work environment in relation to safety signage, emergencies, fire protection, ensuring personal safety, industrial housekeeping and pollution sources and controls.

T3 Hazards and risks and control measures in working on construction sites.

Note.

Hazards include (not limited to) manual and mechanical handling; working at heights; working in confined spaces; noise; dusts.

T4 Workplace safety check, identifying potential workplace hazards and suggested measures for accident prevention.

T5 Working safely with electrical tools or equipment

T6 Current procedure for safe isolation of an electrical supply.

T7 Hazards associated with, extra-low voltage, low-voltage, high voltage and high-currents

T8 Hazards and control measures associated with electrical work

T9 Emergency procedures for the rescue of an electric shock victim equipment

T10 Emergency first aid for an electric shock victim

Note:

Emergency first aid is limited to first-on-the scene assistance to a victim of electric shock, and basics of CPR.

KS02-EG197A Evidence shall show an understanding of electrical installations testing and verification to an extent indicated by the following aspects:

T1 Current electrical installations legislated regulations and responsibilities of a licensed electrician

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REQUIRED SKILLS AND KNOWLEDGE

T2 Current compliance standards and regulatory requirement of electrical equipment and how and where it is installed.

T3 Current compliance standards and regulatory requirement for testing safety parameters of installed circuits, switchgear, protection and earthing.

T4 Current compliance standards and regulatory requirement for documenting and reporting compliance inspection and testing outcomes.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

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equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Apply currency of safe working practices and compliance verification of electrical installations as described as described in 8) and including:

A Preparing to enter a workplace.

B Identifying work safety hazards

C Applying current safe working practices

D Identifying visual non-compliance defects.

E Using effective methods for conducting mandatory and optional tests.

F Identifying non-compliance from test results.

G Identifying causes of non-compliance.

H Completing mandatory reporting.

I Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to verifying compliance and functionality of general electrical installations.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in verifying compliance of an electrical installations comprising a main switchboard, supplying more than one circuit each for, lighting, socket outlets, a distribution board separate from the main switchboard and at least two circuits supplying fixed appliances one of which three-phase.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electrical

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UEENEEG198A Apply compliance requirements to all aspects of electrical work

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers competencies to apply OHS and electrical installation safety obligations of persons licensed to undertake electrical work. It encompasses OHS requirements for identifying hazards, establishing levels of risk mitigation control, following safe working methods, determining whether an electrical installation is compliant, dealing with installation defects and documenting activities and outcomes.

Application of the Unit

Application of the Unit

2)

This unit is intended for electrical license holders who, according to the regulatory authority, have exhibited recalcitrance in their licence and/or OHS obligations.

It may be called up electrical safety or OHS authority as a means of retraining of such license holders. Incompetence in not meeting required obligation could result from:

A competent person acting incompetently, or

A previously competent person failing to keep abreast of changes and developments in the OHS requirements and practices, the Wiring Rules and local service rules and related regulatory requirements.

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Licensing/Regulatory Information

License to practice **3)**

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to practice in the workplace where work is carried out on electrical equipment or installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after has been confirmed that the participant is a practicing ‘electrician’ and hold a current ‘Unrestricted Electrician’s Licence’ issued in an Australian State or Territory.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Apply OHS compliance requirements	1.1	Permission to enter a work site, such as construction industry 'White Card', permit to work systems, industrial plant safety orientation, is obtain in accordance with OHS requirements.
	1.2	OHS risk control measures and procedures given in Safe Work Method Statements (SWMS) or Job Safety Analysis (JSA) documents followed.
	1.3	New or changed hazards are identified, the level of risk they pose assigned and control measures established before any related work is commenced.
	1.4	The level of risk and control measures for a new or changed hazard is documented in accordance with OHS requirements.
	1.5	Hazards created by other site activities are referred to person of appropriate authority such as company or site safety officer, construction project manager, employee representative and

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ELEMENT	PERFORMANCE CRITERIA	
		the like.
	1.6	OHS documents including incidents and issues reports are maintained in accordance with requirements with copies at the relevant work sites.
2 Ensure electrical installations are safe for use	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Compliance of an installation is determined in accordance with AS/NZS 3000 Wiring Rules Part 2 Section 8 following AS/NZS 3017 Electrical Installations— Verification guidelines
3 Document electrical installation verification compliance activities	3.1	Non-compliance defects are identified and reported in accordance with established procedures.
	3.2	Recommendations for rectifying defects are made in accordance with established procedures.
	3.3	Mandatory documentation is completed in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of compliance requirements to all aspects of electrical work.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG198A Electrical work compliance requirements

Evidence shall show an understanding of compliance requirements to all aspects of electrical work testing and verification to an extent indicated by the following aspects:

T1 OHS requirements encompassing:

- Legislated regulations
- Responsibilities of employers and employees
- Hazards and risks and control measures
- Safe Work Method Statements (SWMS) / Job safety analysis (JSAs)
- Identifying potential workplace hazards and establishing control measures
- Maintaining OHS documents

T2 Electrical installation safety requirements encompassing:

- Legislated regulations
- Visual inspecting of installations
- Testing installations
- Documentation

Note:

Safety requirements include local service rules and application of current editions AS/NZS 3000 Wiring Rules following AS/NZS 3017 Electrical installations — Verification guidelines

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Applying compliance requirements to all aspects of electrical work as described in 8) and including:

A Following requirements to gain entry to a work site

B Following OHS control measures and procedures

C Identifying new and changes hazards, assigning a realist level of risk and establishing appropriate control measures.

D Maintaining OHS documents and incidents and issues

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reports in accordance with requirements

E Determining whether an electrical installation is compliant in accordance with regulations

F Documenting installation compliance verification activities and outcomes

G Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to applying compliance requirements to all aspects of electrical work.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential

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knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to both a residential, commercial and industrial installations

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEG199A Conduct compliance and functional verification of electrical apparatus and existing circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers inspection and testing to verify whether an electrical apparatus and/or existing circuits are safe and complies with all requirements. It encompasses working safely, visual inspections and mandatory, optional and functional testing following verification procedures, identifying non-compliance defects and mandatory reporting requirements.

Application of the Unit

Application of the Unit **2)**

2.1) General Application

This unit applies to all qualifications, competencies and/or Skill Sets which require an unrestricted electrical fitter licence.

Licensing/Regulatory Information

License to practice **3)**

During Training: Competency development activities are subject to regulations directly related to licencing, occupational health and safety and where applicable contracts of training such as apprenticeships.

In the workplace: The application of the skills and knowledge described in this unit require a license to

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License to practice **3)**

practice in the workplace where work is carried out on electrical equipment or existing circuits which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c.

Other conditions may apply under State and Territory legislative and regulatory requirements.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle and assemble and utilities components
UEENEEE104A	Solve problems in d.c circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107B	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG0	Arrange circuits, control and protection for

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Prerequisite Unit(s) **4)**

63A	general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

Current Licence Holders:

Those holding an 'Electrical Fitter Licence' or equivalent issued in an Australian State or Territory meet the requirements of this unit and its pre-requisite requirements.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to inspect and test electrical apparatus and existing circuits.	1.1	OHS measures for the site are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	Documentation or deemed to comply standard on which electrical apparatus and existing circuits is based is reviewed and understood.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
	1.7	Preparatory work is checked to ensure no damage has occurred and complies with requirements.

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ELEMENT	PERFORMANCE CRITERIA	
2 Visually inspect and conduct safety testing on electrical apparatus and existing circuits.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and following switch-off, lock out and tagging procedures.
	2.4	Knowledge of electrical principles and their application to electrical apparatus and existing circuits is drawn upon in determining whether an electrical apparatus/existing circuits is compliant and functions safely and as intended.
	2.5	Wiring is checked for suitability for the environments in which they are installed and suitably protected from damage or overheating.
	2.6	Protection methods and devices are validated as meeting co-ordination requirements for overload and short-circuit protection.
	2.7	Switchgear and control gear is validated as being appropriately rated and meeting functional requirements.
	2.8	Evidence that electrical equipment complies with safety requirements is cited.
	2.9	Earthing system components are checked that they are correctly located and conductors correctly sized.
	2.12	Mandatory tests are conducted on all connected electrical apparatus and existing circuits to verify that: earthing conductor resistance is sufficiently low; insulation resistance is sufficiently high; all polarities are correct; and circuit connections are correct.

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ELEMENT	PERFORMANCE CRITERIA	
	2.12	Testing is conducted to verify that: fault-loop impedance is sufficiently low and residual current devices operates as intended.
3 Report inspection and test findings.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Non-compliance defects are identified and reported in accordance with established procedures.
	3.4	Recommendations for rectifying defects are made in accordance with established procedures.
	3.5	Mandatory documentation is completed in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and verifying compliance and functionality of electrical apparatus and existing circuits.

The knowledge and skills shall be contextualised to current industry standards, technologies and practices.

KS01-EG199A Electrical apparatus and existing circuits — verification and testing

Evidence shall show an understanding of electrical apparatus and existing circuits testing and verification to an extent indicated by the following aspects:

T1 (Is the number correct?)Electrical safety encompassing:

- Safety procedures for working on electrical systems, circuits and apparatus.
- Safe working practices as a normal part of carrying out electrical installation work
- Isolation and lockout procedures
- Tools and equipment needed to conduct electrical work compliance inspection and testing.

T2 Legislated regulations encompassing:

- legislation and regulations that require electrical apparatus and existing circuits to be inspected and tested to ensure they are safe.
- the person/bodies responsible for the various aspects of ensuring electrical apparatus and existing circuits are safe.
- results of tests that show an electrical apparatus and existing circuits is safe for connection to the supply.
- results of periodic inspection and tests that show electrical equipment are safe to use.

T3 Visual inspection of electrical apparatus and existing circuits for compliance with the Wiring Rules encompassing:

- Protection requirements
- General condition
- Wiring systems
- Equipment and accessories
- Earthing

T4 Testing electrical apparatus and existing circuits encompassing:

- tests to ensure: insulation resistance is adequate; earth continuity is such that it will ensure the operation of protection devices under earth fault conditions; polarity of active/s and neutral for final subcircuits is correct; there is no transposition of earthing and neutral conductors; fault-loop impedance is sufficiently low; RCD for correct operation and sensitivity.

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REQUIRED SKILLS AND KNOWLEDGE

- functional tests to ensure active/s and neutral for the same circuit are clearly identified with their circuit protection device.
- tests that show all circuits and devices operate as intended.
- tests to determine the fault level at a particular point in an installation.

T5 Documentation encompassing:

- results of tests conducted on an electrical apparatus and existing circuits comply with requirements and ensure the installation is safe.
- documents of the results of testing electrical apparatus and existing circuits as required by the local supply authority.
- documents of periodic testing and inspection of electrical equipment including tagging requirements.

KS02–EG199A Electrical apparatus and existing circuits — principles and requirements

Evidence shall show an understanding of electrical apparatus and existing circuits principles and requirements to an extent indicated by the following aspects:

T1 (Is the number correct?)Effects of electric current encompassing:

- Physiological effects of current.
- Basic principles by which an electric current can produce heat, light, motion and a chemical reaction.

T2 Single path practical circuit encompassing:

- Arrangement of energy source, protection device, switch and load in a circuit.
- The purpose of each component in the circuit.
- Consequences of an open-circuits, closed-circuits and short-circuits.

T3 Single-source multiple-path d.c. circuits encompassing:

- Circuit configurations and connection.
- Relationship between parameter of voltage, current, resistance power dissipation in the whole or any part of the circuit.
- Safely measuring the parameters for the whole or any part of the circuit.
- Methods of determining circuit behaviour for variation in any of the parameters from measured and calculated values.

T4 Alternating voltage and current generation, phase relationships, energy in an a.c. circuit encompassing:

- Sinusoidal voltage generation and resulting current.
- The terms period; maximum value; peak-to-peak value; instantaneous value; average value; root-mean-square (r.m.s.) value; and frequency.
- Three-phases generation.
- Relationship between the phase voltages generated in a three-phase alternator and the conventions for identifying each.
- Method of determining the phase sequence or phase rotation of a three-phase

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REQUIRED SKILLS AND KNOWLEDGE

supply.

- Methods of determining power and energy supplied by three phase circuits.

T5 Fundamental safety principles of the AS/NZS 3000 Part 1 (Section 1) and deemed to comply solution given in Part 2 encompassing:

- Definition of terms
- Fundamental safety principles of protection against direct and indirect contact with live parts; thermal effects; overcurrent; earth faults; abnormal voltages; spread of fire; mechanical injury and external influences.
- Fundamental principles of installation design; selection and installation of equipment; means of compliance (including alterations, additions and repairs) and verification of compliance.

T6 Electric motor selection, starting method and overload protection encompassing:

- Types of motor enclosures suitable for given environmental conditions
- Criteria for selecting motor starters and overload protection.
- Types and connection arrangements for direct-on-line and reduced voltage starters.
- Thermal, magnetic and thermistor overload protection methods.

T7 Ability to apply AS/NZ 3000 requirements for protective and functional earthing encompassing:

- Purpose of protective and functional earthing.
- Parts of the protective earthing systems.
- Earthing arrangements, earthing of equipment and equipotential bonding.
- Methods of determining the maximum fault loop impedance for a circuit.
- Selection of protective conductor and active conductor sizes for each circuit to ensure earth-fault loop impedance is sufficiently low to operate the circuit protective device.

T8 MEN system and its application encompassing:

- The roles of the protective earthing (PE) and neutral (N) conductors in an a consumer’s installation and their relationship to the protective earth neutral (PEN) conductor in the electricity distributor’s system or sub-main to an outbuilding.
- The importance of the MEN link when a fault occurs.
- The likely consequences of the absence of the MEN link or high impendence in the PEN conductor when a fault occurs.
- The requirements for installation of an MEN link in an installation and an outbuilding.

T9 Knowledge of the application of transformers encompassing:

- Transformers used in distribution and transmission systems and large consumer installations.
- Transformers used in welding machines.
- Applications in appliances

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REQUIRED SKILLS AND KNOWLEDGE

- Risks and safety control measures associated with connection and disconnection of instrument transformers
- Safe working procedures when connecting and testing transformers.
- AS/NZS 3000 requirements and restriction on the installation and use of transformers.

T10 Ability to apply AS/NZ 3000 requirements for protection of circuit against overcurrent and abnormal voltages encompassing:

- Minimum fault levels specified by electricity distributors
- Methods and arrangement for protection against short-circuit currents and overload currents.
- Coordination of overload and short-circuit protection devices.
- Coordination between conductors and overload protection device.
- Causes of over and undervoltage.
- Device and requirements for protection against over and undervoltage.

T11 Additional protection by use of RCDs and use of extra-low voltage for basic and fault protection encompassing:

- Limitation of an RCD to protect against contact with live parts
- AS/NZS 3000 requirements for use of RCDs.
- Conditions for use of extra-low voltage to provide for basic and fault protection
- AS/NZS 3000 requirements for installation of SELV and PELV systems

T12 Ability to apply AS/NZS 3000 requirements for control and protection of electrical apparatus and existing circuits encompassing:

- Devices for functions of isolation; emergency; Mechanical maintenance and functional control.
- Method for assessing prospective short circuit current.
- Devices and arrangement for protection against overload and short-circuit current.
- Additional protection by RCD
- Protection against switchboard internal arc faults.

T13 Knowledge of AS/NZS 3000 requirements for electrical apparatus and existing circuits in hazardous areas encompassing:

- Types of areas classified as a hazardous area
- Standards to which the maintenance of electrical equipment shall comply.
- Addition training required to work competently with electrical equipment for hazardous areas

T14 Ability to verify compliance of electrical apparatus and existing circuits in accordance with AS/NZS 3000 encompassing:

- Visual inspection to determine whether the electrical apparatus and existing circuits complies with requirements set out in Section 2 to 7 of AS/NZS 3000 and relevant specific installation standards.

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REQUIRED SKILLS AND KNOWLEDGE

- Mandatory tests following guidance given in AS/NZS 3017
- Portable tool safety testing and tagging system in accordance with AS/NZS 3760.

T15 Ability to perform effective safe isolation of any equipment encompassing:

- Preparation of a 'safe work method statement' (SWMS) or Job Safety Analysis (JSA) for effective safe isolation.
- Safe methods for identifying source of supply to be isolated.
- Switching-off, lock-out and tagging procedures.
- Safe methods for confirming effective and safe isolation

T16 Ability to apply AS/NZS 3000 requirements to carryout repairs and terminating thermoplastic insulated cables; elastomer sheathed cables; XLPE sheathed cables; and high temperature cables; armoured cables; and neutral screened cables in a wide range of applications.

T17 Ability to perform the circuit tests required for electrical cables in a range of installations and final sub-circuit encompassing:

- Following safe testing procedures.
- Tests to show if the earth continuity and earth-fault loop impedance are sufficiently low.
- Testing to show if insulation resistance is sufficiently high.
- Testing to show if the polarity and circuit connections are correct.

T18 Ability to read, sketch and interpret electrical diagrams encompassing:

- Purpose and characteristics of schematic, block and wiring diagrams, plans and schedules.
- Conventions used in documenting electrical information
- Read and interpret schematic, block and wiring diagrams, plans and schedules
- Sketch electrical diagrams using conventional symbols

T19 Knowledge and understanding occupational safety and health encompassing:

- Basics of Occupational Safety and Health regulations
- Legal responsibilities for employers and employees
- Employers' and employees' own "duty of care".
- Safety committees and their role

T20 Knowledge and understanding of the requirements for personal safety in the workplace encompassing:

- Purpose and use of Safe Work Method Statements (SWMS) or Job Safety Analysis (JSA).
- Purpose and process of reporting OHS incidents.
- Safety procedures for working with electrical circuits and equipment.
- Procedures for safe and effective isolation of electrical supply.
- Regulations for the supervision of apprentices and trainees.

T21 Process in rescuing a person in contact with live electrical conductors or

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REQUIRED SKILLS AND KNOWLEDGE

equipment and the primary importance of the safety of the rescuer.

T22 Application of emergency first aid requirements for an electric shock victim encompassing:

- Calling for help.
- Applying cardiopulmonary resuscitation (CPR).
- Selection and use of fire extinguishers to control electrical fire at accident site.

T23 Dangers of high voltage equipment and distribution systems encompassing:

- Step and touch and induced voltages.
- Sources of induced voltage and stored energy
- Creepage and clearance requirements.
- Application of safe working procedures in the vicinity of HV equipment.

T24 Systematic method of commissioning and decommissioning electrical equipment and existing circuits encompassing:

- Commissioning safety procedures
- Circuit voltage testing
- Phase rotation checks
- Functional testing
- Instrument and control parameter settings
- Decommissioning safety procedures.
- Identification of circuits with their control and protection devices.
- Impact of isolation on other parts of an installation.
- Tagging, testing and earthing.
- Safe removal of equipment.

T25 Diagnosing and rectifying faults in electrical apparatus and existing circuits encompassing:

- Faults such as open-circuit; short-circuit; incorrect connections; insulation failure; unsafe condition; apparatus/component failure; related mechanical failure;
- Apparatus such as control devices; fixed appliances/accessories; lighting; electrical machines motors and controls; socket outlets, transformers; protection and metering devices.
- Circuits such as those supplying fixed appliances; lighting; socket outlets; motors and controls circuits; transformers; electronic or computer based equipment.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Verify compliance and functionality of general electrical apparatus and existing circuit installations as described as described in 8) and including:

A Selecting correct tools and testing equipment.

B Identifying visual non-compliance defects.

C Using effective methods for conducting mandatory and optional tests.

D Identifying non-compliance and functional defects from

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test results.

E Identifying causes of non-compliance and functional defects.

F Completing mandatory reporting.

G Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to verifying compliance and functionality of electrical apparatus and existing circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to verification and testing for at least two types of installations containing electrical apparatus and existing circuits comprising an apparatus and existing circuit supplied by a single phase supply. The other installations shall include apparatus and existing circuits supplied by a three phase supply.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UEENEEH101A Repair basic computer equipment faults by replacement of modules/sub-assemblies

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit deals with the repair of computer equipment by replacement of slot/plug connected modules/sub-assemblies. It encompasses safe working practices, following written and oral instruction and procedures, basic testing techniques, dismantling and assembling apparatus and disconnecting and reconnecting components.

Application of the Unit

Application of the Unit

2)

This unit may apply to persons entering work in electro technology and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

AND

UEENEEE104A	Solve problems in d.c. circuits

OR

UEENEEE123A	Solve basic problems in electronic and digital equipment

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Prerequisite Unit(s) **4)**

UEENEEE104 A Solve problems in d.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair computer equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	The nature of the repair is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established routines and procedures.
	1.6	Tools, apparatus and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Repair computer equipment	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Apparatus is dismantled in accordance with manufacturer’s guide and supervisor’s instructions.
	2.5	Modules/sub-assemblies are tagged during the dismantling to help ensure correct and efficient reassembly and stored to protect them against loss or damage.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Repairs are affected efficiently without damage to other components, apparatus or circuits.
	2.7	Apparatus is assembled in an appropriate sequence with all modules/sub-assemblies and parts correctly placed, secured and connected in accordance with manufacturer's guide or industry practice.
	2.8	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.9	Repairs are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report repair work activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Repaired computer equipment is prepared and forwarded to appropriate person(s) for testing.
	3.3	Work area is cleaned and made safe in accordance with established procedures.
	3.4	Work supervisor is notified of the completion of the repair work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out basic repairs to electronic apparatus by replacement of modules/sub-assemblies.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies..

KS01-EH101A Basic computer equipment repairs

Evidence shall show an understanding of modules/sub-assemblies replacement for basic computer equipment repairs, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Personal computers structure and components and their function, including motherboards, memory modules, video modules, connecting buses, storage devices and the like.

T2. Personal computers assembling and dismantling techniques

T3. Personal computers hardware faults and troubleshooting techniques, confined to subsystem level

T4. Basic network hardware and components

T5. Connection of network media

T6. Set up of standard network configuration

T7. Cable and conductor terminations used in electronic equipment:

- Cable and conductor types and characteristics:
  - Insulated wire
  - Harness wiring,
  - High performance cables - characteristics are transmission performance parameters and electrical characteristics
  - Types include UTP, FTP, and STP
- Coaxial cables types and characteristics - qualshield, trishield coaxial are armour plated coaxial cables
- Cable anchoring and support methods
- Termination methods

T8. Basic repairs to computer equipment by replacing modules/sub-assemblies

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out basic repairs to computer equipment by replacement of modules/sub-assemblies as described in 8) and including:

A Following manufacturer service instructions for access to components.

B Removing at least three different functional types of modules/sub-assemblies in the work instructions.

C Replacing modules/sub-assemblies to manufacturer

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requirements.

D Repairing damaged wires/ribbon cable to an industry standard and without damage to other equipments; includes minor soldering.

E Reassembling the computer equipment correctly.

F Testing computer equipment operation.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Relevant Australian and International industry standards for the repair of electronic assemblies and sub-assemblies
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out basic repairs to electronic apparatus by replacement of modules/sub-assemblies.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out repairs to personal computers and servers. The repairs shall be limited to:

- Replacement of at least three slot/plug connected modules/sub-assemblies having different functions and in which the fault has been previously established, and
- Repair to broken wires/ribbon cable to industry standards, that may include, minor soldering

Note:

1. Examples of Modules include self contained hardware components such as motherboards, memory cards, storage devices.

2. Examples of Sub-assemblies include collections of integrated components that may form part of a module that are designed to be replaceable for servicing, such as the component part of a hard drive module or motherboard.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH102A Repairs basic electronic apparatus faults by replacement of components

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit deals the replacement of electronic components, cabling and sub systems of electronic apparatus. It encompasses safe working practices, following written and oral instruction and procedures, basic testing and techniques, dismantling and assembling apparatus and disconnecting and reconnecting components.

Application of the Unit

Application of the Unit

2)

This unit may apply to persons entering work in electro technology and may be used in school based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to repair electronic apparatus.	1.1 OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3 The nature of the repair is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5 Sources of materials that may be required for the work are established in accordance with established routines and procedures.
	1.6 Tools, apparatus and testing devices needed

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ELEMENT		PERFORMANCE CRITERIA	
			to carry out the work are obtained and checked for correct operation and safety.
2	Repair electronic apparatus.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Apparatus is dismantled in accordance with manufacturer's guide and supervisor's instructions.
		2.5	Component parts are tagged during the dismantling to help ensure correct and efficient reassembly and stored to protect them against loss or damage.
		2.6	Repairs are affected efficiently without damage to other components, apparatus or circuits.
		2.7	Apparatus is assembled in an appropriate sequence with all components parts placed, secured and connected in accordance with manufacturer's guide or industry practice.
		2.8	Procedures for referring non-routine events to immediate supervisor for directions are followed.
		2.9	Repairs are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Complete and report repair work activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Repaired apparatus is prepared and forwarded to appropriate person(s) for

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ELEMENT	PERFORMANCE CRITERIA	
		testing.
	3.3	Work area is cleaned and made safe in accordance with established procedures.
	3.4	Work supervisor is notified of the completion of the repair work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out basic repairs to electronic apparatus by replacement of components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH102A Component replacement to repair basic electronic apparatus faults

Evidence shall show an understanding of component replacement to repair basic electronic apparatus faults, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Electronic soldering equipment and techniques

- Workshop hazards and safety associated with soldering
- Quality concepts
- Electronic soldering equipment
- The soldering process
- Lead free solder

T2. Printed circuit board soldering techniques

- Electronic component mounting
- Solder rework of printed circuit boards.
- Faulty solder joints

T3. Soldering electronic cables

- Soldering multi-strand, ribbon and coaxial cables
- Effects and prevention of electrostatic discharge (ESD)

T4. Electronic component basics

- Types of components
- The physical features and primary characteristic of components
- Marking and codes on components
- Handling static sensitive components

T5. Electronic cable overview and coaxial cable

- Coaxial cables types and characteristics
- Coaxial cable termination

T6. Performance copper cables

- Twisted pair voice and data cables
- Insulation displacement (IDC) termination

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REQUIRED SKILLS AND KNOWLEDGE

- Colour codes
- Terminating performance cables
- Harness wiring

T7. Electronic apparatus components

- Fault finding
- Testing
- Replacement

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment

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- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out basic repairs to electronic apparatus by replacement of components as described in 8) and including:

A Following manufacturer service instructions for access to components.

B Removing at least three different types of components specified in the work instructions.

C Replacing components to manufacturer requirements.

D Terminating correctly electronic cables using solderless termination techniques

E De-soldering and soldering to a high reliability standard and without damage to components.

F Reassembling the apparatus correctly.

G Testing apparatus operation.

H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

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Note: Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out basic repairs to electronic apparatus by replacement of components.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out basic repairs electronic apparatus limited to replacement or repair of components, including sub systems in which the fault has been previously established.

At least two of the repairs shall require soldering and desoldering and at least two of the repairs shall require a cable to be correctly terminated using a solderless termination technique.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH103A Repair routine business equipment faults

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the confirmation of predictable faults and repair of such faults by repair or replacement of mechanical components and replacement of discrete and integrated components of business electronic equipment. It encompasses safe working practices, following written and oral instruction and routine testing and repair procedures, verifying equipment operation and reporting.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, cords and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair business equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the repair is obtained from documentation or from work supervisor or customer to establish the scope of work to be undertaken.

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ELEMENT	PERFORMANCE CRITERIA	
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established routines and procedures.
	1.6	Tools, apparatus and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Repair business equipment.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Predictable faults are confirmed by following routine testing procedures.
	2.5	Apparatus is dismantled in accordance with manufacturer’s service guide and supervisor’s instructions.
	2.6	Component parts are tagged during the dismantling to help ensure correct and efficient reassembly and stored to protect them against loss or damage.
	2.7	Repairs are made in accordance with manufacturer’s service guide and supervisor’s instructions.
	2.8	Apparatus is assembled in an appropriate sequence with all components parts placed, secured and connected in accordance with manufacturer’s guide or industry practice.
	2.9	Repaired equipment is test in accordance with

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ELEMENT	PERFORMANCE CRITERIA	
		routine procedures to verify that it functions correctly.
	2.10	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.11	Repairs are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report repair work activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Equipment is place into service and customer and work supervisor notified of the completion of the repair work in accordance with routine procedures.
	3.4	Service report is complete in accordance with routine procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out routine repairs to business equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH103A Business equipment fault finding and repair

Evidence shall show an understanding of business equipment fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Operational concepts of business machines

- Purpose and function of common business machines
- Operation, adjustment and maintenance of photocopiers, facsimile machines, printers and PCs
- The electronic communications and connections between business machines
- Hazardous materials used in the office and handling procedures

T2. Electro-mechanics of business machines

- The operating features of electric motors, relays and solenoids, clutches and tachometers
- Function and operation of feed mechanisms, drive-trains and cleaning processors

T3. Business equipment software basics

- Programming methods
- Configuration options
- Administration and maintenance functions

T4. Electronic cable and conductor terminations

- Cable and conductor types and characteristics:
  - Insulated wire
  - Harness wiring,
  - High performance cables - characteristics are transmission performance parameters and electrical characteristics
  - Types include UTP, FTP, and STP
- Coaxial cables types and characteristics - qualshield, trishield coaxial are armour plated coaxial cables
- Cable anchoring and support methods
- Termination methods

T5. Electronic safe working practices

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REQUIRED SKILLS AND KNOWLEDGE

- Risk management and assessment of risk encompassing:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:
  - Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage encompassing:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage encompassing:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Safety, selection, use, maintenance and care of test equipment encompassing:
  - Safety characteristics of electrical testing devices,
  - Chemical cleaning solvents, glues and joining wastes used in electronics,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

T6. Business equipment fault finding and repair

- Fault finding table, charts and procedures
- Testing procedures
- Component replacement and repair

T7. Enterprise communication methods

- Communicating with personnel encompassing:
  - Oral communications
  - Written procedures and work instructions
- Communicating with suppliers
- Communicating with customers

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out routine repairs to business equipment as described in 8) and including:

A Following service instructions to confirm reported fault.

B Following service instructions to access components.

C Removing and replace mechanical components.

D Removing and replace electrical/electronic components.

E Reassembling the business equipment correctly.

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F Testing equipment operation.

G Completing service report accurately.

H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out routine repairs to business equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies.

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This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED101A Use computer applications relevant to a workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEH102A Repair basic electronic apparatus faults by replacement of components

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in carrying out routine repairs to business equipment by confirming at least four predictable faults in low volume (up to 40 ppm) photocopiers and following routine procedures to repair such faults.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH104A Set up and test residential video/audio equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers setting-up of non-fixed audio and video equipment as directed in user manuals in a residential or business environment. It encompasses safe working practices, connection and secure and optimum placement of system components, following written and oral instruction and procedures and customer relations.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set up audio/video equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are reported and advise on risk control measures are sought from the work supervisor.
	1.4	Details of the system are obtained from purchase documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.6	Materials that may be required for the work are

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ELEMENT	PERFORMANCE CRITERIA	
		obtained and checked in accordance with routines and procedures.
	1.7	Tools and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Set up audio/video equipment.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/components are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	System components are unpacked to ensure they are complete and undamaged.
	2.5	System components are placed for optimum performance within constrains imposed by the area and customer.
	2.6	Systems components are connected in accordance with manufacturer's instructions.
	2.7	System functions are set to customer's requirements and tested for correct operation.
	2.8	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.9	System set up is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete system set up and report.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established routines.

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	All system/component documentation is handed over to the customer.
	3.4	Work supervisor is notified of the completion of the work in accordance with established routine.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up and testing residential audio/video equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH104A Residential video/audio equipment

Evidence shall show an understanding of residential video/audio equipment setting up and testing procedures, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Audio and video component functional controls

- Types of components and their functional controls
- Function set up procedures
- Testing

T2. Audio and video system set up

- Audio components in a system
- Video components in a system
- Component connection arrangements
- Set up options and procedures

T3. Electronic cable and conductor terminations

- Cable and conductor types and characteristics:
  - Insulated wire
  - Harness wiring,
  - High performance cables characteristics are transmission performance parameters and electrical characteristics
  - Types include UTP, FTP, and STP
- Coaxial cables types and characteristics - qualshield, trishield coaxial are armour plated coaxial cables
- Cable anchoring and support methods
- Termination methods

T4. Electronic safe working practices

- Risk management and assessment of risk encompassing:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
- Parts of an electronic systems and equipment where high-currents are likely.

- Risks and control measures associated with high-voltage encompassing:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage encompassing:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Safety, selection, use, maintenance and care of test equipment encompassing:
  - Safety characteristics of electrical testing devices,
  - Chemical cleaning solvents, glues and joining wastes used in electronics,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment

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intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up and test residential audio/video equipment as described in 8) and including:

A Unpacking and checking system components against purchase documents and manufacturer's content list.

B Placing components for optimum performance within constrains imposed by the area and customer.

C Connecting components to manufacturer's instructions.

D Setting functional controls to customer's requirements.

E Testing functional operation.

F Completing necessary documentation, including handing over all system/component documents to the customer.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up and testing residential audio/video equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in setting up and testing residential audio/video equipment by assembling, setting up and functional testing:

- An audio system consisting of a pair of speakers, a preamplifier/power amplifier or an integrated amplifier, tuner and compact disk player, and
- An audio/video system consisting of television receiver, 5-channel amplifier, five speakers and a digital versatile disk player.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH105A Verify functionality and compliance of custom electronic installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers testing and visual inspection for verifying that a custom electronic system and components are safe and comply with requirements and functions as intended. It encompasses working safely, conducting compliance tests, conducting visual inspections, identifying non-compliance defects and mandatory reporting requirements.

Application of the Unit

Application of the Unit

2)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Where the components of the custom electronic system

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License to practice **3)**

are connected to the public telephone system facility practice in the workplace is also subject to ACMA regulations to undertake cabling work.

Note:

Units ‘UEEEEF101A and UEEEEF102A provide the required skill and knowledge for registration in accordance with ACMA regulations for undertaking cabling work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises

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Prerequisite Unit(s) **4)**

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to verify custom electronic installations.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	Location of system components is determined from specifications and diagrams.
	1.6	Inspection and tests are appropriately sequenced in accordance with job schedule.
	1.7	Materials needed for the tests and verification are obtained in accordance with established procedures and checked against job requirements.
	1.8	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
2 Visually inspect the installation.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Cabling is checked for appropriate type and size.
	2.4	Cabling, accessories and components are validated as being suitably located, securely fixed and suitably protected from damage or corrosion.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Accessories and components are validated as being appropriately rated and meeting functional requirements.
	2.6	Evidence that equipment complies with safety and functional requirements is cited.
	2.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.9	Inspection is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Conduct tests.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Testing or measuring on a live and operating system in strict accordance with OHS requirements and within established safety procedures.
	3.3	Circuits/machines/plant are checked as being isolated in strict accordance OHS requirements and procedures.
	3.4	Tests are conducted to verify that the cabling is safe and meets specified standards and any applicable regulatory requirements.
	3.5	Custom electronic apparatus and devices are tested to ensure the installation is safe and functions as intended.
	3.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	3.7	Unexpected situations are dealt with safely

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ELEMENT		PERFORMANCE CRITERIA	
			and with the approval of an authorised person.
		3.8	Testing is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
4	Report inspection and verification findings.	4.1	OHS work completion risk control measures and procedures are followed.
		4.2	Work site and equipment is cleaned and made safe in accordance with established procedures.
		4.3	Non-compliance defects are identified and reported in accordance with established procedures.
		4.4	Recommendations for rectifying defects are made in accordance with established procedures.
		4.5	Work completion is documented and an appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and verifying compliance and functionality of custom electronic installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH105A Custom electronic installations, testing and verification methods

Evidence shall show an understanding of custom electronic installations, testing and verification methods, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Sound reproduction fundamentals

- Sound wave propagation
- Timbre of sound
- Effects of other medium of sound waves
- Characteristics of the human ear
- Difference between mono and stereo
- Surround sound principles

T2 Audio reproduction, electronic components

- Preamplifiers amplifier encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Power and integrated amplifiers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Graphic equalizers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Component installation and interconnections

T3 Audio reproduction, speaker fundamentals

- Types of speaker drives and their operating mechanism
- Speaker cabinet characteristics
- Purpose and circuit arrangement of typical cross-over networks
- Speaker installation and connections

T4 Audio/video recording and replay components repair basics

- Sub-system components (i.e. functional blocks) and their operating parameters

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REQUIRED SKILLS AND KNOWLEDGE

- Common faults, their symptoms and cause.
- Fault location procedures and testing points
- Device adjustments - audio/video recording and replay components are audio cassette player/recorders, compact disk players, video cassette player/recorder, digital versatile disk and super audio compact players.

T5 Audio/video control equipment

- Types of control devices and their operating principles
- Control equipment arrangement in an audio/video system

T6 Video systems installation

- Installation and set-up of digital TV reception equipment
- Installation and set-up of DVD machines
- Operating requirements of remote control units

T7 Electronic safe working practices

- Risk management and assessment of risk encompassing:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:
  - Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage encompassing:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage encompassing:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Safety, selection, use, maintenance and care of test equipment encompassing:
  - Safety characteristics of electrical testing devices,
  - Chemical cleaning solvents, glues and joining wastes used in electronics,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are

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included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Verify compliance and functionality of custom electronic installations as described in 8) and including:

A Identifying visual defects.

B Conducting all tests safely and correctly.

C Identifying non-compliant defects from test results.

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D Recommending appropriate corrective actions.

E Acting within regulatory limits.

F Reporting legibly and accurately.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to verifying compliance and functionality of custom electronic installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to verifying compliance and functionality of custom electronic installations with at least two different new or existing custom electronic installations. One installation shall include a basic integrated system.

Verification shall include the following:

- Visual inspection of cabling, accessories and apparatus and controls
- Conducting all safety and compliance tests

Note:

1. Testing includes isolation testing; insulation resistance; cable tests to specified standard (e.g. Category 5 standard); polarity tests; continuity of earthing; correct connections performance tests.

2. Electrical testing may be limited by the scope permitted under restricted electrical work

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH106A Assemble and set up fixed video/audio components and systems in buildings and premises

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installing of fixed audio/video components and systems in a residential or business environment. It encompasses safe working practices; secure placement and connection of system components, following written and oral instruction and procedures and customer relations.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training or approved training programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various

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License to practice **3)**

jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in

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this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install audio/video components and systems.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines.
	1.2	Established OHS risk control measures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.

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ELEMENT	PERFORMANCE CRITERIA	
	1.4	The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor and/or other appropriate person to ensure the work is co-ordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established routines.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Install audio/video components and systems.	2.1	Established OHS risk control measures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Audio/video components are installed to comply with standards and job specifications with sufficient excess to affect terminations.
	2.4	Accessories are installed straight and square in the required locations and within acceptable tolerances.
	2.5	Cables and conductors are terminated at accessories in accordance with manufacture's specifications and regulatory requirements
	2.6	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.7	The installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete installation work and report.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Work supervisor is notified of the completion of the installation work in accordance with established routines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assembling and setting up fixed audio/video components and systems in buildings and premises.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EA106A Video/audio components and system assembly

Evidence shall show an understanding of video/audio components and system assembly and setting up in building and premises, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Sound reproduction fundamentals

- Sound wave propagation
- Timbre of sound
- Effects of other medium of sound waves
- Characteristics of the human ear
- Difference between mono and stereo
- Surround sound principles

T2. Audio reproduction, electronic components

- Preamplifiers amplifier encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Power and integrated amplifiers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Graphic equalizers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Component installation and interconnections

T3. Audio reproduction, speaker fundamentals

- Types of speaker drives and their operating mechanism
- Speaker cabinet characteristics
- Purpose and circuit arrangement of typical cross-over networks
- Speaker installation and connections

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REQUIRED SKILLS AND KNOWLEDGE

T4. Audio/video recording and replay components repair basics

- Sub-system components (i.e. functional blocks) and their operating parameters
- Common faults, their symptoms and cause.
- Fault location procedures and testing points
- Device adjustments - audio/video recording and replay components are audio cassette player/recorders, compact disk players, video cassette player/recorder, digital versatile disk and super audio compact players.

T5. Audio/video control equipment

- Types of control devices and their operating principles
- Control equipment arrangement in an audio/video system

T6. Video systems installation

- Installation and set-up of digital TV reception equipment
- Installation and set-up of DVD machines
- Operating requirements of remote control units

T7. Electronic safe working practices

- Risk management and assessment of risk encompassing:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:
  - Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage encompassing:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage encompassing:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Safety, selection, use, maintenance and care of test equipment encompassing:
  - Safety characteristics of electrical testing devices,
  - Chemical cleaning solvents, glues and joining wastes used in electronics,

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REQUIRED SKILLS AND KNOWLEDGE

- Safe use of electrical testing device, and
- Checks and storage methods for maintaining the safety of testing devices.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to

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its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble and set up fixed audio/video components and systems in buildings and premises as described in 8) and

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including:

A Reading and interpreting drawings of circuit arrangements and component locations.

B Placing and securing components and accessories accurately.

C Maintaining fire integrity.

D Terminating cable and conductors correctly.

E Connecting components to manufacturer's instructions.

F Setting functional controls to customer's requirements.

G Testing functional operation.

H Completing necessary documentation including handing over all system/component documents to the customer.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

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The resources used for assessment should reflect current industry practices in relation to assembling and setting up fixed audio/video components and systems in buildings and premises.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE108A Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by assembling and setting up fixed audio/video systems in building and premises on at least two occasions.

Systems are to consist of surround sound and multi-room speakers, central audio and home theatre components.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH107A Repair predictable faults in general electronic apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers identifying predictable faults and repairing by replacement of subassemblies in electronic apparatus. The unit encompasses safe working practices, interpreting circuit diagrams and service manuals, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to

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License to practice **3)**

regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components
UEENEEH111A	Troubleshoot single phase input d.c. power supplies

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Prerequisite Unit(s)

4)

UEENEEH112A	Troubleshoot digital sub-systems
UEENEEH113A	Troubleshoot amplifier circuits
UEENEEH138A	Fault find and repair complex power supplies

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’.

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair electronic apparatus.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment, testing devices and service manual needed to carry out the work are obtained in accordance with established

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ELEMENT	PERFORMANCE CRITERIA	
		procedures and checked for correct operation and safety.
2 Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Fault finding is approached methodically drawing on knowledge of electronic apparatus and circuit using measured and calculated values of apparatus parameters and/or with reference to manufacturer's service manual.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Repairs are made in accordance with manufacturer's service guide and supervisor's instructions.
	2.8	Apparatus is reassembled and tested for safety and functionality in preparation for return to the customer.
	2.9	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.10	Repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Written justification is made for repairs to apparatus.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out repairs of predictable faults in general electronic apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH107A General electronic apparatus repair

Evidence shall show an understanding of fault-finding techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Technical manuals and catalogues

- Typical format
- How to read and apply information

T2. General electronic apparatus fault finding and repair

- Block diagram sub-system components (i.e. functional blocks) and their operating parameters
- Common faults, their symptoms and cause.
- Fault location procedures and testing points
- Component repair/replacement
- Device adjustments - general electronic apparatus are data capture devices, security panels, fire protection panels, industrial control apparatus, instrumentation electronics and any apparatus not specifically covered under other clauses but for which there is a service manual and circuit diagrams.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out repairs of predictable faults in general electronic apparatus in buildings and premises as described in 8) and including:

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A	Using methodical fault finding techniques.
B	Finding faults efficiently.
C	Replacing components without damage.
D	Providing written justification for the repairs.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out repairs of predictable faults in general electronic apparatus.

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Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH111A	Troubleshoot single phase input d.c. power supplies
UEENEEH112A	Troubleshoot digital sub-systems
UEENEEH115A	Develop software solutions for microcontroller based systems
UEENEEH139A	Troubleshoot basic amplifier circuits

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out repairs of predictable faults in two different general electronic apparatus for a given representative range.

Note.

Examples of general electronic apparatus are data capture devices, security panels, fire protection panels, industrial control apparatus, instrumentation electronics and the like.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH108A Assemble and install reception antennae and signal distribution equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation, positioning and securing of terrestrial and satellite arrays and dishes and associated amplifiers and the reticulation of cables and connection of multiple access outlets and associated equipment. It encompasses safe working practices, selection of antennae and distribution components, installation techniques, use of testing devices and following written and oral instruction and procedures.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training or approved training programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and set-up reception antennae and signal distribution systems.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines.
	1.2	Established OHS risk control measures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.
	1.4	The nature and location of the work is obtained

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ELEMENT	PERFORMANCE CRITERIA	
		from work supervisor or other appropriate person to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor and/or other appropriate person to ensure the work is co-ordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established routines.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Install reception antennae and signal distribution systems.	2.1	Established OHS risk control measures for carrying out the work are followed.
	2.2	Circuits/components are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	The optimum location for an antenna to be installed is determine from signal tests and limitation imposed by the customer and regulation.
	2.4	Accessories are installed straight and square in the required locations and within acceptable tolerances.
	2.5	Cables and conductors are terminated at accessories in accordance with manufacture's specifications and regulatory requirements.
	2.6	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.7	The installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Set-up reception antennae and signal distribution systems and report.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Adjustments are made to the antenna and the system to optimise reception at each outlet.
	3.3	Work site is cleaned and made safe in accordance with established procedures.
	3.4	Work supervisor is notified of the completion of the installation work in accordance with established routines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assembling and erecting reception antennae and signal distribution equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH108A Antenna assembly and installation

Evidence shall show an understanding of antenna assembly and installation, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. signal reception

- Inadequate / optimum / excessive signal level
- Multipath transmission
- Interference

T2. TV antennas

- Types
- Operating characteristics
- TV antenna terminology
- Multiple antennas
- Assembly and installation

T3. Transmission lines

- Types
- Characteristic impedance
- Attenuation
- Bandwidth
- Standing waves
- Installation

T4. Antenna distribution systems

- Identical and adjacent channel interference
- Masthead/distribution amplifiers
- Diplexors
- Triplexors
- Splitters and couplers
- “T” networks and existing loop wired networks
- practical small distribution system design
- Field strength meters

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REQUIRED SKILLS AND KNOWLEDGE

- Attenuators
- VCR output injection
- Installation

T5. Satellite receivers

- Block diagram
- Operating characteristics
- Installation

T6. Antenna fault-finding

- Common faults
- Fault finding and repair
- Testing

T7 Electronic safe working practices

- Risk management and assessment of risk encompassing:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:
  - Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage encompassing:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage encompassing:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Safety, selection, use, maintenance and care of test equipment encompassing:
  - Safety characteristics of electrical testing devices,
  - Chemical cleaning solvents, glues and joining wastes used in electronics,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble and erect reception antennae and signal distribution equipment as described in 8) and including:

A	Reading and interpreting drawings of circuit arrangements and component locations.
B	Placing and securing antenna and accessories accurately.

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C	Maintaining fire integrity.
D	Terminating cable and conductors correctly.
E	Adjusting for optimum reception at each outlet.
F	Dealing with unplanned events by drawing on essential knowl and skills to provide appropriate solutions incorporated in a ho assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evid on which competency is deemed. In these cases the alignment of outcomes of vendo training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling and erecting reception antennae and signal distribution equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by installing, connecting and setting up a typically representative reception antennae and signal distribution systems on at least two occasions.

Systems are to consist of multiple outlets for multiple users.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH109A Set up and test gaming and game equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers setting-up of electronic gaming and games equipment to manufactures' instructions in compliance with regulations. It encompasses safe working practices, connection and secure placement of gaming/games equipment, following written and oral instruction and procedures and customer relations.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also be used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, access to gaming premises and where applicable contracts of training such as apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set up gaming equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.
	1.4	Details and location of the equipment to be set up are obtained from purchase documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Materials that may be required for the work are obtained and checked in accordance with routines and procedures.
	1.7	Tools and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Set up gaming equipment.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Equipment is placed in accordance with regulatory and customer requirements.
	2.4	Equipment is connected in accordance with manufacturer's instructions and regulatory and customer requirements. (see note 1)
	2.5	Equipment operating functions are set to regulatory and customer requirements and tested for correct operation.
	2.6	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.7	Equipment set up is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete system set up and report.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established routines.
	3.3	Documentation detailing equipment maintenance and operating instructions is handed over to the customer.
	3.4	Work supervisor is notified of the completion of

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ELEMENT	PERFORMANCE CRITERIA
	the work in accordance with established routine. Note 1: Connection of equipment may include both plug connected power supply and network

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up and testing gaming/games equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH109A Gaming and game equipment set up and testing

Evidence shall show an understanding of gaming and game equipment set up and testing, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Enterprise communication methods

- Communicating with personnel encompassing:
  - Oral communications
  - Written procedures and work instructions
- Communicating with suppliers
- Communicating with customers

T2. Enterprise customer relations protocols

- Purpose of customer relations
- Procedures for dealing with customers
- Dealing with customer issues

T3. Regulatory requirements and codes of practice for the gaming equipment

- Types of equipment permitted —
  - Location restrictions and requirements
  - Operational restrictions and requirements
- Security encompassing:
  - Access to customers premises
  - Access to machines

T4. Gaming machine systems and equipment overview

- Gaming industry terminology
- Functions and specifications of the machine and its components
- Types of gaming machines
- Operational features of different machines and systems

T5. Gaming machine equipment adjustment and maintenance

- Machine access and security encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- master reset procedures,
- opening and closing doors,
- period reset procedures,
- use of audit and reset key

- Tests, adjustments and clearances encompassing:
  - Coin/note jams
  - Hopper to coin chute
  - Screens
  - Touch screen calibration
- Removals, installs and checks encompassing:
  - Bank note acceptors,
  - Card readers
  - Coin comparators,
  - Divertor
  - Drop doors
  - Hopper
  - Lighting
  - Machine positioning and mounting
  - Printer paper roll feeding
  - Switches
- Attendant screens and functions

T6. Electronic Safe working practices

- Risk management and assessment of risk encompassing:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:
  - Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage encompassing:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage encompassing:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or

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REQUIRED SKILLS AND KNOWLEDGE

equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Safety, selection, use, maintenance and care of test equipment encompassing:
  - Safety characteristics of electrical testing devices,
  - Chemical cleaning solvents, glues and joining wastes used in electronics,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up and test gaming/games equipment as described in 8) and including:

A	Placing equipment in accordance with regulatory and customer requirements.
B	Connecting equipment to manufacturer's instructions and regulatory and customer requirements.
C	Setting functional controls to regulatory and customer's requirements.
D	Testing functional operation.
E	Completing necessary documentation including handing over equipment maintenance and operating instructions documents t the customer.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed item

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

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These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up and testing gaming/games equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be in relation to setting up and testing a representative range of gaming machines connected to a network and commercial games machines to customer and regulatory requirement.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH110A Install commercial video/audio system components

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation of components for audio/video facilities in buildings and premises. The unit encompasses working safely and to specifications and standards, matching equipment with that specified for a given location, terminating and interconnecting cables/conductors and completing the necessary installation documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training or approved training programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install audio/video components and systems.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines.
	1.2	Established OHS risk control measures are

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ELEMENT	PERFORMANCE CRITERIA	
		followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.
	1.4	The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor and/or other appropriate person to ensure the work is co-ordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established routines.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Install audio/video components and systems.	2.1	Established OHS risk control measures for carrying out the work are followed.
	2.2	Circuits/components are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Audio/video components are installed to comply to standards and job specifications with sufficient excess to affect terminations.
	2.4	Accessories are installed straight and square in the required locations and within acceptable tolerances.
	2.5	Cables and conductors are terminated at accessories in accordance with manufacture’s specifications and regulatory requirements.
	2.6	Procedures for referring non-routine events to immediate supervisor for directions are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	The installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3 Complete installation work and report.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Work supervisor is notified of the completion of the installation work in accordance with established routines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing commercial audio/video system components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH110A Commercial audio/video system installation

Evidence shall show an understanding of commercial audio/video system installation, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects

T1. Sound reproduction fundamentals

- Sound wave propagation
- Timbre of sound
- Effects of other medium of sound waves
- Characteristics of the human ear
- Difference between mono and stereo
- Surround sound principles

T2. Audio reproduction, electronic components

- Preamplifiers amplifier encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Power and integrated amplifiers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Graphic equalizers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Component installation and interconnections

T3. Audio reproduction, speaker fundamentals

- Types of speaker drives and their operating mechanism
- Speaker cabinet characteristics
- Purpose and circuit arrangement of typical cross-over networks
- Speaker connections

T4. Loud speakers and microphones

- Loud speaker construction and applications
- Operation of circuits and cross over networks

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REQUIRED SKILLS AND KNOWLEDGE

- Optimum layout of speaker systems
- Principle and operation of microphones
- Speaker and microphone installation in connections

T5. Specialist audio/video cabling installation and termination

- Features of high performance audio and video cables and interconnects
- High performance audio and video cables and interconnects encompassing:
  - Installation methods and limitations
  - Terminations techniques as specified by cable manufacturers

T6. Professional audio electronics

- Complex audio systems used for live sound or theatre application
- Connections and phasing of equipment
- Optimum signal levels for the acoustic environment
- Connection and adjustment of signal processing units
- Tuning, adjustment and diagnosis of systems

T7. Video and display set up

- Projectors encompassing:
  - Aspect ratio
  - Screen size
  - Orientation
  - Throw distance, vertical elevation and horizontal orientation
- Direct view monitors adjustments

T8. Audio/video control equipment

  - Types of control devices and their operating principles
  - Control equipment arrangement in an audio/video system

T9. Audio/video recording and replay components basic faults and repairs

- Sub-system components (i.e. functional blocks) and their operating parameters
- Common faults, their symptoms and cause.
- Fault location procedures and testing points
- Device adjustments - audio/video recording and replay components are audio cassette player/recorders, compact disk players, video cassette player/recorder, digital versatile disk and super audio compact players.

T10 Electronic Safe working practice encompassing:

- Risk management and assessment of risk:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents:
  - Parts of an electronic systems and equipment that operate at low-voltage and

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REQUIRED SKILLS AND KNOWLEDGE

extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Safety, selection, use, maintenance and care of test equipment:
  - Safety characteristics of electrical testing devices,
  - Chemical cleaning solvents, glues and joining wastes used in electronics,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install commercial audio/video system components as described in 8) and including:

A	Reading and interpreting drawings of system arrangements and component locations.
B	Placing and securing components and accessories accurately.
C	Maintaining fire integrity.
D	Connecting apparatus and associated components to comply with requirements.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing commercial audio/video system components.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

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UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to installing and connecting a typically representative range of commercial audio/video system components in buildings and premises on at least two occasions.

Note:

Examples of systems are dedicated audio and video facilities in meeting rooms, video conferencing facilities, and centrally controlled audio/video facilities across a number of locations.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electronics

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UEENEEH111A Troubleshoot single phase input d.c. power supplies

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers determining correct operation of independent power supplies and power supply sections of electronic apparatus. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in d.c. power supplies with single phases input.

Application of the Unit

Application of the Unit

2)

This competency standard unit is intended for development of competency in either entry-level employment based programs incorporated in approved contracts of training or other approved training programs. It may also be used to augment formally acquired competencies.

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s)

4)

UEENEEE104A	Solve problems in d.c. circuits
UEENEEH102A	Repair basic electronic apparatus faults by replacement of components

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus

OR

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits

OR

UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’.

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to troubleshoot d.c. power supplies.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Solve d.c. power supply problems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of dc power supplies using measured and calculated values of parameters.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Fault finding activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to troubleshooting problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and troubleshooting d.c. power supplies with single phase input.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies..

KS01-EH111A Single phase input d.c. power supplies

Evidence shall show an understanding of single phase input d.c. power supplies , applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects

T1. power supplies operating principles and applications

- Power supply function
- Block diagram identifying each sub-system
- Expected waveforms in a power supply
- Constant Voltage
- Constant Current

T2. D.C. rectification circuits

- Junction diode characteristics
- Transformer turns ratio and losses
- Half wave and full wave rectifiers
- Dual rail supply

T3. Filter circuits

- Capacitive and inductive filters
- Ripple

T4. Zener diode regulator

- Zener shunt regulator circuit
- Load and line regulation definitions
- Operating parameters and data sheets

T5. Three terminal regulator circuits

- Need for regulation
- Three terminal regulator characteristics
- Short circuit protection
- Line and load regulation
- Regulated power efficiency
- Remote voltage sensing

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REQUIRED SKILLS AND KNOWLEDGE

T6. Electronic testing and measuring devices and techniques

- Test/measuring devices and their application - analogue and digital multimeters, voltage and digital testers, signal generators and oscilloscopes
- Connection of test/measuring devices into a circuit encompassing:
  - safety procedures
  - circuit arrangement of test/measuring devices
- Taking readings
- Storage, maintenance and care of test/measuring devices

T7. D.C. power supply testing and fault finding

- Rectifier diode faults
- Zener diode faults
- Three terminal regulator faults

T8. OH&S

- Apply safe working practices and relevant Standards, Codes and Regulations

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside

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the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Troubleshoot d.c. power supplies with single phase input as described in 8) and including:

A Using methodical problem solving methods.

B Taking measurements correctly and accurately.

C Calculating parameters correctly and accurately.

D Providing solution to power supply problems, and

E Providing written justification for the solutions to problems.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials

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to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to troubleshooting d.c. power supplies with single phase input.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to troubleshooting d.c. power supplies with single phase input on the rectification section and filtering section of a half wave bridge rectifier and a full wave bridge rectifier.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH112A Troubleshoot digital sub-systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers determining correct operation of digital sub-systems. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in digital components circuits.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended for development of competency in either entry-level employment based programs incorporated in approved contracts of training or other approved training programs. It may also be used to augment formally acquired competencies.

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other

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License to practice **3)**

conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEH102A	Repair basic electronic apparatus faults by replacement of components

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in

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this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to troubleshoot digital sub-systems.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to

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ELEMENT		PERFORMANCE CRITERIA	
			ensure the work is co-ordinated effectively with others.
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Troubleshoot digital sub-systems.	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Fault finding is approached methodically drawing on knowledge of digital components using measured and calculated values of parameters.
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Fault finding activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Complete work and document troubleshooting activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to troubleshooting problems is documented.
		3.4	Work completion is documented and an appropriate person or persons notified in

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ELEMENT	PERFORMANCE CRITERIA
	accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and troubleshooting digital subsystems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH112A Digital sub-system

Evidence shall show an understanding of digital sub-system troubleshooting, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Analogue and digital signals

- Comparison between analogue and digital signals
- Observing digital and analogue waveforms

T2. Numbering systems

- The binary number system
- The hexadecimal number system
- Binary addition and subtraction

T3. Numbering systems - conversions

- Conversion between numbering systems
- Binary Coded Decimal (BCD)
- Gray code
- The American Standard Code for Information Interchange (ASCII)
- Unicode

T4. Combinational logic circuits

- Precautions when handling electronic devices due to electrostatic discharge (ESD)
- Truth tables
- Basic operation and characteristics of logic gates
- Logic probes
- Verification of operation of logic circuits

T5. Digital displays

- Seven segment LED displays
- Drive requirements
- Current limiting
- Multiplexed displays
- Seven segment Decoders
- Liquid Crystal Displays (LCD)

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REQUIRED SKILLS AND KNOWLEDGE

- Emerging display technologies
- Verification of seven segment display circuit
- Interfacing with logic circuits

T6. Digital subsystem building blocks

- Encoders and Decoders
- Multiplexers and Demultiplexers
- Timing diagrams
- Flip flops, Latches and registers
- Ripple counters
- MOD counters
- Synchronous counters Multi-vibrators
- Clocks
- Verification and operation (eg. PLDs, ICs)

T7. Digital fault finding

- General fault finding principles
- Common digital faults
- Digital test equipment
- Digital test equipment (eg. Logic probes, Digital Oscilloscopes, digital trainers)

T8. Logic families and specifications

- Input and output voltage characteristics
- Comparison of logic families
- Unit load
- Noise margin
- Interfacing different logic families
- Tri-state logic devices

Overview and applications of A/D converter and D/A converter

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Troubleshoot digital subsystems as described in 8) and including:

A	Using methodical problem solving methods.
B	Taking measurements correctly and accurately.
C	Calculating parameters correctly and accurately.
D	Providing solution to digital component/circuit problems.

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E	Providing written justification for the solutions to problems.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed item

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential

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knowledge and skills described in this unit.

The resources used for assessment should reflect current industry practices in relation to troubleshooting digital subsystems.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH 102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH 116A	Find and repair microwave amplifier section faults of electronic apparatus
UEENEEH 139A	Troubleshoot basic amplifier circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to troubleshooting a digital subsystem with at least three types of basic digital components/circuits or functions.

The troubleshooting must be demonstrated on three types of faults.

Notes:

1. The range of faults may include: open/shorted signal lines, output loading, input-to-input connections and clock-related faults.

2. Troubleshooting may involve the alteration of an existing digital subsystem to comply with a specified function and operating parameters.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH113A Troubleshoot amplifiers in an electronic apparatus

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Insert complete pre-requisite pathway	
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers determining correct operation of amplifiers. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in amplifier sections/circuits.

Application of the Unit

Application of the Unit

2)

This competency standard unit is intended for development of competency in either entry-level employment based programs incorporated in approved contracts of training or other approved training programs. It may also be used to augment formally acquired competencies.

This unit is intended to apply to any recognised development program that leads to the acquisition of a

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formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the

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Prerequisite Unit(s) **4)**

identified Pathway Unit Group(s):

Electrotechnology

Electronics and Communications

Electrical

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEH102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH139A	Troubleshoot basic amplifier circuits

Electrotechnology Pathway Group

Unit Code	Unit Title
UEENEEH169A	Solve problems in basic electronic circuits

Electronics and Communications Pathway Group

Unit Code	Unit Title
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus

Electrical Pathway Group

Unit Code	Unit Title
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to troubleshoot amplifiers.	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 OHS risk control work preparation measures and procedures are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	The nature of amplifier fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Troubleshoot amplifiers.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of amplifiers using measured and calculated values of parameters.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Fault finding activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and document troubleshooting activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to troubleshooting problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and troubleshooting amplifiers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH113A Amplifier fundamentals

Evidence shall show an understanding of amplifier troubleshooting, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Single stage discrete amplifier d.c. characteristics

- Risk and safety
- Field effect transistors (FET) and Bi-junction transistor (BJT) circuit symbols
- Quiescent (Q) point
- Biasing methods for BJT and FETs
- Circuit theory for BJT and FETs
- Verification of performance of BJT and FET amplifier circuits

T2. Single-stage discrete amplifier small signal characteristics

- Small signal gain
- Gain measurements
- Overdrive conditions

T3. Capacitive coupling in single-stage discrete amplifiers

- Coupling capacitor functions
- Coupling capacitor effect on low frequency response
- Emitter\source bypass capacitor effect on low frequency response
- Verification of circuit operation and frequency response (eg. Bode Plot).

T4. Multistage amplifier coupling methods

- Coupling methods
- Total gain
- Bandwidth considerations
- Verification of circuit operation

T5. Differential amplifiers

- Differential amplifier concept
- Typical circuit operation
- Differential and common-mode gain
- Common mode rejection

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REQUIRED SKILLS AND KNOWLEDGE

- Constant current and voltage sources
- Verification of circuit operation

T6. Negative feedback

- Concept of negative feedback
- Effects of negative feedback
- Negative feedback configurations
- Amplifier gain and negative feedback

T7. Introduction to classes of power amplifier operation

- Power efficiency
- Classes and applications
- Crossover distortion
- Class AB operation
- Heat sinking

T8. Complimentary symmetry power amplifiers

- Biasing and crossover distortion
- Power efficiency
- Quasi-complimentary and Darlington output configurations
- Complete amplifier operation
- D.C. operating condition calculations
- Verification of circuit operation

T9. Other solid state power amplifier design

- Transformer coupled power amplifiers
- I.C. power amplifiers
- Class D power amplifiers

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Troubleshoot amplifiers as described in 8) and including:

A	Using methodical problem solving methods.
B	Taking measurements correctly and accurately.
C	Calculating parameters correctly and accurately.
D	Providing solution to amplifier problems.

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E	Providing written justification for the solutions to problems.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to troubleshooting amplifiers.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are

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assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH112A	Troubleshoot digital sub-systems
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH115A	Develop software solutions for microcontroller based systems
UEENEEH116A	Find and repair microwave amplifier section faults of electronic apparatus
UEENEEH139A	Troubleshoot basic amplifier circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to troubleshooting an amplifier in at least three types of electronic apparatus.

The troubleshooting must be demonstrated on three types of faults.

Notes:

1. The range of faults may include: distortion, excessive power consumption, low gain and limited frequency responses. 2. Troubleshooting may involve the alteration of an existing amplifier to comply with a specified function and operating parameters.

- Determining the operating parameters of an amplifier section of an electronic apparatus.
- Modifying an existing amplifier section to comply with specified operating parameters
- Developing an amplifier section to comply with a specified function and operating parameters
- Finding and repairing a fault in an amplifier section of an electronic apparatus

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH114A Troubleshoot resonance circuits in an electronic apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers determining correct operation of resonance circuits used in electronic apparatus. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in resonance circuits.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended for development of competency in either entry-level employment based programs incorporated in approved contracts of training or other approved training programs. It may also be used to augment formally acquired competencies.

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not

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License to practice **3)**

require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

AND

UEENEEE104A	Solve problems in d.c. circuits

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Prerequisite Unit(s) **4)**

OR

UEENEEH1 69A Solve problems in basic electronic circuits

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to troubleshoot resonance circuits.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve in resonance circuits.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of resonance circuits using measured and calculated values of parameters.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Fault finding activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable

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ELEMENT	PERFORMANCE CRITERIA	
		energy practices.
3 Complete work and document troubleshooting activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to troubleshooting problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and troubleshooting frequency dependent circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH114A Resonance circuits troubleshooting

Evidence shall show an understanding of resonance circuit troubleshooting, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Basic engineering mathematics

- SI Units
- Using a calculator.
- Basic Algebra
- Applying the laws of indices.
- Simplification of expressions involving square roots.
- Graphs and tables.
- Pythagoras' Theorem and trigonometry ratios.

T2. Sinusoidal alternating voltage and current

- Generating a sinusoidal waveform
- Definition of the terms period, peak, peak-to-peak, instantaneous, average, and root-mean-square value
- Calculating the instantaneous value of a sinusoidal waveform
- Calculating the root-mean-square value and frequency of a of a sinusoidal waveform
- Phase relationship between two or more sinusoidal waveforms
- Common waveforms used in electronic circuitry
- Observation of sinusoidal and other waveforms

T3. A.C. measuring equipment

- Operating principles of a cathode ray oscilloscope (CRO)
- Set up, calibration and use of a CRO
- Calibration and limitation of CRO probes
- Analogue and digital a.c. measuring instruments including true root-mean-square reading instruments
- Measurement of the instantaneous, peak, peak-to-peak values and period of sinusoidal and other common waveforms

T4. Phase relationships in a.c. circuits

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REQUIRED SKILLS AND KNOWLEDGE

- Phasor representation of sinusoidal waveforms
- Definitions of in-phase, out-phase, phase angle, lead and lag
- Phasor addition of two voltages or currents

T5. Resistive a.c. circuits

- Ohms law in a.c resistive circuits
- Current and voltage phase relationship
- Power dissipation

T6. Inductance in a.c. circuits

- Principles of inductance
- Units
- Inductive time constant circuits
- Inductive reactance
- Ohms law in inductive a.c. circuits
- Phase relationships
- Verification of operation of RC time constant circuit

T7. Capacitance in a.c. circuits

- Capacitive reactance
- Ohms law in capacitive a.c. circuits
- Current and voltage phase relationships

T8. Series a.c. circuits

- Definition of Impedance
- Impedance
- The impedance triangle
- Voltages distribution
- Vector representation of current and voltages
- Verification of operation of series a.c. circuit

T9. Parallel a.c. circuits

- Current distribution
- Vector representation of voltage and currents
- Impedance calculations based on total circuit current and voltage
- Verification of operation of parallel a.c. circuit

T10. Series-parallel a.c. circuits

- Examples of circuit
- Rules for simplification

T11. Power factor

- Power triangle
- True power

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REQUIRED SKILLS AND KNOWLEDGE

- Apparent power
- Reactive power
- Power factor
- Power factor correction

T12. Ideal transformer

- Construction and operating principles
- Step-up, step-down, turns ratios, voltage and current ratios
- Autotransformer
- Core losses
- Types of cores and applications
- Volt-Ampere (VA) rating
- Verification of operation of transformer circuit

T13. Series resonance

- Conditions in a circuit that produce series resonance
- Relationship between resonance and frequency
- Impedance of a series resonant circuit
- Phasor representation of current and series voltage drops in series resonant circuit
- Voltage magnification
- The Q of a coil and its relevance
- Bandwidth and half power points in a resonant circuit
- Selectivity
- Verification of operation of series resonant circuit

T14. Parallel resonance

- Conditions in a circuit that produce parallel resonance
- Impedance of a parallel resonant circuit
- Vector representation of voltage and parallel branch currents in a parallel resonant circuit
- Current magnification
- Verification of operation of parallel resonant circuit

T15. Filters

- Purpose of a filter
- Circuits for operation of the following passive filter circuits: high pass, low pass, band stop and band pass
- Bandwidth, attenuation, cut-off, roll off and order of filter
- Measurements and calculations relating to passive filters
- Curves showing the behaviour of various types of filter circuits
- Verification of operation of each filter type

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Troubleshoot frequency dependent circuits as described in 8) and including:

A	Using methodical problem solving methods.
B	Taking measurements correctly and accurately.
C	Calculating parameters correctly and accurately.
D	Providing solution to resonance circuit problems.

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E	Providing written justification for the solutions to problems.
F	Dealing with unplanned events by drawing on essential knowle and skills to provide appropriate solutions incorporated in a ho assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evid on which competency is deemed. In these cases the alignment of outcomes of vendo training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to troubleshooting frequency dependent circuits.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE104A Solve problems in d.c. circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solving at least two of the following types of resonance circuit problems.

- Determining the operating parameters of an existing circuit
- Altering an existing circuit to comply with specified operating parameters
- Developing circuits to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH115A Develop software solutions for microcontroller based systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing, implementing and testing programming solutions in microcontroller based systems. It encompasses following development brief, using appropriate development software, writing code, applying problem solving procedures, testing and modifying of programs.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 3 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop code.	1.1	OHS processes and procedures for a given work area are obtained and understood.
		1.2	Established OHS risk control measures and procedures in preparation for the work are

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ELEMENT		PERFORMANCE CRITERIA	
			followed.
		1.3	The extent of code development work is determined from job performance specifications and in consultations with relevant persons.
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
		1.5	Appropriate development kit and software are selected based on specified requirements and performance standard.
		1.6	Strategies are implemented to ensure programming is carried out efficiently.
2	Develop code.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Correct syntax is applied when developing code.
		2.3	Key features of the programming language used are applied to develop and test solutions. Note: Key features may include use of registers, addressing modes, assembler instructions, subroutines and flags.
		2.4	Approaches to issues/problems are analysed to provide most effective solutions.
		2.5	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3	Test and document the development of code.	3.1	Testing procedures are developed to analyse code.
		3.2	Problems and bugs in code are rectified to ensure specifications are met.
		3.3	Intermediate and final work reports are

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ELEMENT	PERFORMANCE CRITERIA
	written in accordance with professional standards and presented to appropriate person or persons.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing software for microcontroller based systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH115A Software programming fundamentals

Evidence shall show an understanding of software programming fundamentals, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Semiconductor memory

- memory cell
- antistatic precautions
- memory organization
- storage capacity and density

T2. Overview of Address decoding

T3. Microprocessor/ Microcontroller architecture

- internal architecture of a microprocessor
- single chip microcontroller architecture
- programming model of microprocessor/ microcontroller

T4. Programming

- programming concepts
- instruction set
- machine code and assembly language high level and low level language

T5. Addressing modes

- types of addressing modes
- applications for each addressing mode
- programming using different addressing modes

T6. Arithmetic and logic instructions

- types of arithmetic and logic instructions.
- applications for each type of arithmetic and logic instruction.
- programming using arithmetic and logic instructions.

T7. Branch instructions and flowcharts

- types of branching instructions
- applications for each type of branching instruction.

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REQUIRED SKILLS AND KNOWLEDGE

- programming using branching instructions.

T8. Subroutines

- purpose and applications
- stack memory

T9. Timing loops

- concept
- timing calculations
- nested timing loops
- programming using timing loops

T10. Input/Output ports

- input/output port devices and interfacing
- programmable input/ output port ICs

T11. Implementing a program for a specific task

- purpose of program
- writing the program
- debugging and implementing the program

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work

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environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control

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measures as specified in the performance criteria and range statement
    - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
    - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
    - Demonstrate an appropriate level of skills enabling employment
    - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
  - Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
    - Develop software solutions in microcontroller based systems as described in 8) and including:

A Using methodical problem solving methods.

B Providing solution to micro software problems.

C Providing written justification for the solutions to problems.

D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing software solutions in microcontroller based systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by developing software solutions in any microcontrollers/microprocessors using the following techniques:

- Modifying an existing micro program to comply with specified operating parameters
- Developing micro software to comply with a specified function and operating parameters
- Debugging software

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH116A Find and repair microwave amplifier section faults in electronic apparatus

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repair of microwave amplifier sections in electronic apparatus. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits

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Prerequisite Unit(s)

4)

UEENEEH102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH139A	Troubleshoot basic amplifier circuits
UEENEEH146A	Solve fundamental electronic communications system problems

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for

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ELEMENT	PERFORMANCE CRITERIA	
		correct operation and safety.
2 Find faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of microwave amplifier sections and circuit using measured and calculated values of apparatus parameters.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Fault finding activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Repair fault.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	3.3	Materials required for the repair work are sourced and obtained in accordance with established procedures.
	3.4	Repairs are affected efficiently without damage to other components, apparatus or circuits.

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ELEMENT	PERFORMANCE CRITERIA	
	3.5	Effectiveness of the repair is tested in accordance with established procedures.
	3.6	Apparatus is reassembled, finally tested and prepared for return to customer.
4 Completion and report repair activities.	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work area is cleaned and made safe in accordance with established procedures.
	4.3	Written justification is made for repairs to apparatus.
	4.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in the microwave amplifier sections in electronic apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH116A Electronic communications systems

Evidence shall show an understanding of software programming fundamentals, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Microwave amplifiers

- Applications and operational constraints
- Operating principles and parameters
- Amplifier components and circuit configuration
- Amplifier faults, symptoms and causes

T2. Electronic communications, microwave antennae and waveguide fundamentals

- Antenna and wave guide principles and components
- Installation techniques for microwave communication systems
- Setting up techniques for microwave communication systems

T3. Advanced electronic (communication systems) testing and measuring devices and techniques

- Test/measuring devices and their application - frequency counters, and synthesisers, spectrum analysers, noise and distortion meters and RF communications service monitor.
- Connection of test/measuring devices into a circuit encompassing:
  - safety procedures
  - loading and matching
  - storage and delay
  - circuit arrangement of test/measuring devices
- Taking and interpreting readings
- Notion of decibels including dBm, dBr, dBu, dBo

T4. Electronic (communication systems) fault finding

- Factors to consider in clarifying the nature of a fault encompassing:
  - Initial fault report
  - Confirmation of symptoms of the fault

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REQUIRED SKILLS AND KNOWLEDGE

- Comparison of symptoms with normal operation
- Effect to cause reasoning — assumptions of possible causes
- Methods for testing assumptions encompassing:
  - Visual inspection
  - Sectional testing
  - Split-half tests
  - Component isolation
- Dealing with intermittent faults - causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference.

T5. OH&S

- Effects of RF radiation on the human body and work practices to protect against radio frequency radiation.
- Standards, Codes and Regulations of ACMA regulation for power, frequency and antenna gain and Occupational Health &Safety

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1)**
	Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and

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regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as

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specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in the microwave amplifier sections in electronic apparatus as described in 8) and including:

A Using methodical fault finding techniques.

B Finding faults efficiently.

C Replacing components without damage.

D Providing written justification for the repairs.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in the microwave amplifier sections in electronic apparatus.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

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UEENEEH102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH112A	Troubleshoot digital sub-systems
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH115A	Develop software solutions for microcontroller based systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to finding and repairing a representative range of faults in the microwave amplifier sections in at least two types of electronic apparatus.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electronics

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UEENEEH117A Carry out repairs of predictable faults in video and audio replay/recording apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers identifying predictable faults and repairing by replacement of subassemblies in CD, DVD and tape replay/recording apparatus. The unit encompasses safe working practices, interpreting circuit diagrams and service manuals, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to

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License to practice **3)**

regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components
UEENEEH111A	Troubleshoot single phase input d.c. power supplies

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Prerequisite Unit(s)

4)

UEENEEH112A	Troubleshoot digital sub-systems
UEENEEH113A	Troubleshoot amplifier circuits
UEENEEH138A	Fault find and repair complex power supplies

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair replay/recording apparatus.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment, testing devices and service manual needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.

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ELEMENT		PERFORMANCE CRITERIA	
2	Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Fault finding is approached methodically drawing on knowledge of replay/recording apparatus and circuit using measured and calculated values of apparatus parameters and/or with reference to manufacturer's service manual.
		2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
		2.6	Faulty components are rechecked and their fault status confirmed.
		2.7	Repairs are made in accordance with manufacturer's service guide and supervisor's instructions.
		2.8	Apparatus is reassembled and tested for safety and functionality in preparation for return to the customer.
		2.9	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.10	Repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Completion and report repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Written justification is made for repairs to apparatus.

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out repairs of predictable faults in audio and video replay/recording apparatus

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH117A Audio and video recording and replaying apparatus

Evidence shall show an understanding of electronic communications systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Sound reproduction fundamentals

- Sound wave propagation
- Timbre of sound
- Effects of other medium of sound waves
- Characteristics of the human ear
- Difference between mono and stereo
- Surround sound principles

T2. Audio reproduction, electronic components

- Preamplifiers amplifier encompassing:
- Function in the reproduction chain
- Typical circuit arrangements
  - Power and integrated amplifiers encompassing:
- Function in the reproduction chain
- Typical circuit arrangements
  - Graphic equalizers encompassing:
- Function in the reproduction chain
- Typical circuit arrangements
  - Component installation and interconnections

T3. Audio reproduction, speaker fundamentals

- Types of speaker drives and their operating mechanism
- Speaker cabinet characteristics
- Purpose and circuit arrangement of typical cross-over networks
- Speaker installation and connections

T4. Audio/video recording and replay components repair basics

- Sub-system components (i.e. functional blocks) and their operating parameters

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REQUIRED SKILLS AND KNOWLEDGE

- Common faults, their symptoms and cause.
- Fault location procedures and testing points
- Device adjustments - audio/video systems are compact disk players, DVD players and AV systems

T5. Audio/video control equipment

- Types of control devices and their operating principles
- Control equipment arrangement in an audio/video system
- Safe use of electrical testing device, and
- Checks and storage methods for maintaining the safety of testing device

T6. Technical manuals and catalogues

- Typical format
- How to read and apply information

T7. Digital versatile disc (DVD) and compact disc (CD)

- Operational principles and standards of digital signal processing
- Standards and features of DVDs and CDs
- Operation and adjustment of DVDs and CDs, as well as
- Transport mechanisms
- Laser alignment/tracking
- Servo system description, operation and adjustment of servo loops
- System control of player
- On screen display including service mode set-up on adjustment

T8. Digital audio

- Fundamentals of digital audio systems
- Signal processing within the encoding of a system
- Error checking techniques in the encoder process
- Modulation used in the encoding process
- The process for decoding digital audio signals to produce analogue stereo output
- Features and operation of compact disk players

T9. Compact disk players

- Characteristics of optical digital recording
- Components of CD players
- Operation of servo loops
- Digital signal processing
- System control sections of a CD

T10. Digital versatile disk processors

- Operating principles, characteristics, features and standards of DVD players
- Components and adjustment of DVD players

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REQUIRED SKILLS AND KNOWLEDGE

T11. Audio/video recording and replay components repair basics

- Sub-system components (i.e. functional blocks) and their operating parameters
- Common faults, their symptoms and cause.
- Fault location procedures and testing points
- Device adjustments - audio/video systems are compact disk players, DVD players and AV systems

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

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equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out repairs of predictable faults in audio and video replay/recording apparatus as described in 8) and including:

A	Using methodical fault finding techniques.
B	Finding faults efficiently.
C	Replacing components without damage.
D	Providing written justification for the repairs.
E	Dealing with unplanned events by drawing on essential k skills to provide appropriate solutions incorporated in a h with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to e competency is deemed. In these cases the alignment of outcomes of vendor train performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out repairs of predictable faults in

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audio and video replay/recording apparatus.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out repairs of at least four predictable faults in two different video replay/recording apparatus

Note.

Examples of audio/video recording and replay components are audiocassette player/recorders, compact disk players, videocassette player/recorder, digital versatile disk and super audio compact players.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH118A Fault find and repair electronic apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repairing of general electronic apparatus. The unit encompasses safe working practices, consulting apparatus service manuals, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry

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ELEMENT		PERFORMANCE CRITERIA	
			out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Find faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Fault finding is approached methodically drawing on knowledge of data circuits using measured and calculated values of apparatus parameters.
		2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage
		2.6	Faulty components are rechecked and their fault status confirmed.
		2.7	Effectiveness of the repair is tested in accordance with established procedures.
		2.8	Apparatus is reassembled, finally tested and prepared for return to customer.
		2.9	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.10	Fault finding activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Completion and report repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Written justification is made for repairs to apparatus.

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in electronic apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH118A Electronic apparatus fault finding and repair

Evidence shall show an understanding of electronic communications systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Drawings and diagrams

- Drawing types and applications encompassing:
- Drawing layouts and conventions - mechanical drawings, electrical/electronic schematics, wiring diagrams, PC boards, location diagrams (architectural drawings), and cable routes and switching arrangements and building details.
- Drawing symbols - symbols representing electrotechnology circuit components, equipment location and cable routes and control arrangements.
- Freehand drawing
- Cable/wiring/connection and equipment/component/schedules.

T2. Electronic testing and measuring devices and techniques

- Test/measuring devices and their application - analogue and digital multimeters, voltage and digital testers, signal generators and oscilloscopes
- Connection of test/measuring devices into a circuit encompassing:
  - safety procedures
  - circuit arrangement of test/measuring devices
- Taking readings
- Storage, maintenance and care of test/measuring devices

T3. Electronic fault finding

- Factors to consider in clarifying the nature of a fault encompassing:
  - Initial fault report
  - Confirmation of symptoms of the fault
  - Comparison of symptoms with normal operation
- Effect to cause reasoning — assumptions of possible causes
- Methods for testing assumptions encompassing:
  - Visual inspection
  - Sectional testing
  - Split-half tests

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REQUIRED SKILLS AND KNOWLEDGE

- Component isolation
- Dealing with intermittent faults - causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference.

T4. Electronic Safe working practices

- Risk management and assessment of risk encompassing:
  - Of the immediate environment
  - Of the apparatus under repair
- Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:
  - Of the immediate environment
  - Of the apparatus under repair
  - Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage encompassing:
  - Of the immediate environment
  - Of the apparatus under repair
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage encompassing:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Safety, selection, use, maintenance and care of test equipment encompassing:
  - Of the immediate environment
  - Of the apparatus under repair
  - Safety characteristics of electrical testing devices,
  - Chemical cleaning solvents, glues and joining wastes used in electronics,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in electronic apparatus as described in 8) and including:

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A	Using methodical fault finding techniques
B	Finding faults efficiently
C	Replacing components without damage
D	Providing written justification for the repairs
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in electronic apparatus.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to finding and repairing four different faults in two different types of electronic apparatus.

Note.

Examples of electronic apparatus are communication-networking devices, data capture devices, fire protection panels, industrial control apparatus, instrumentation electronics, security panels, and the like.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH119A Repair predictable faults in television receivers

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers identifying predictable faults and their repair by replacement of subassemblies in televisions. The unit encompasses safe working practices, interpreting circuit diagrams and service manuals, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components
UEENEEH111A	Troubleshoot single phase input d.c. power supplies
UEENEEH112A	Troubleshoot digital sub-systems

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Prerequisite Unit(s) **4)**

UEENEEH113A	Troubleshoot amplifier circuits
UEENEEH138A	Fault find and repair complex power supplies

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair televisions.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment, testing devices and service manual needed to carry out the work are obtained in accordance with established

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ELEMENT	PERFORMANCE CRITERIA	
		procedures and checked for correct operation and safety.
2 Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of televisions and circuit using measured and calculated values of apparatus parameters and/or with reference to manufacturer's service manual.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Repairs are made in accordance with manufacturer's service guide and supervisor's instructions.
	2.8	Apparatus is reassembled and tested for safety and functionality in preparation for return to the customer.
	2.9	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.10	Repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Written justification is made for repairs to apparatus.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out repairs of predictable faults in television receivers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH119A Television receiver repairs

Evidence shall show an understanding of television receiver repairs, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Technical manuals and catalogues

- Typical format
- How to read and apply information

T2. Introduction to television

- Fundamentals of the Australian broadcast television system in block diagram form
- Functions of a television camera using block diagrams
- Functions of a television receiver using block diagrams
- Principles and operations of picture tubes
- The principles of the Australian PAL colour television process
- Television receiver aerials

T3. Television scanning and deflection

- Operation of a synchronised separator, synchronised horizontal oscillator and drive stages, horizontal transistor output stage
- Operation of and repair to vertical deflection circuitry
- Operation of Raster correction circuits

T4. Television chrominance and luminance

- Chrominance and luminance signal processing at the transmitter
- Luminance signal process in the receiver including video buffer, traps and filters, video amplifiers, video output stages, brightness and contrast circuits
- Chrominance signal processing in the receiver including, chroma decoder, sub-carrier regeneration, chroma signal processing, final matrix output.

T5. Television receiver repair basics

- Sub-system components (i.e. functional blocks) and their operating parameters
- Common faults, their symptoms and cause.
- Fault location procedures and testing points
- Device adjustments

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are

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included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out repairs of predictable faults in television receivers as described in 8) and including:

A	Using methodical fault finding techniques.
B	Finding faults efficiently.

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C	Replacing components without damage.
D	Providing written justification for the repairs.
E	Dealing with unplanned events by drawing on essential knowle and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcome vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out repairs of predictable faults in television receivers.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is

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expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out repairs to of at least four predictable faults in a representative range of CRT television receivers.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH120A Fault find and repair gaming and games equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of gaming equipment. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

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License to practice **3)**

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components
UEENEEH109A	Set up and test gaming and game equipment
UEENEEH111A	Troubleshoot single phase input d.c. power supplies

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Prerequisite Unit(s)

4)

UEENEEH112A	Troubleshoot digital sub-systems
UEENEEH113A	Troubleshoot amplifier circuits
UEENEEH138A	Fault find and repair complex power supplies

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and

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ELEMENT	PERFORMANCE CRITERIA	
		checked for correct operation and safety.
2 Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of gaming equipment and circuit using measured and calculated values of apparatus parameters.
	2.5	Equipment components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Faulty components are readjusted or replace in accordance with established procedures.
	2.8	Effectiveness of the repaired component is tested in accordance with established procedures.
	2.9	Apparatus is reassembled, finally tested and prepared for return to customer.
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.11	Fault finding and repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Written justification is made for repairs to apparatus including components and materials used.
	3.4	Acceptance that the reported fault(s) have been repaired is sought from an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in gaming and games equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH120A Gaming machine fault finding and repair

Evidence shall show an understanding of gaming machine fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Technical manuals and catalogues

- Typical format
- How to read and apply information

T2. Gaming equipment communications

- Online and stand alone systems
- Common gaming networks
- Linked jackpot networks
- Player tracking systems

T3. Gaming machine fault finding

- Sub-system components (i.e. functional blocks) and their operating parameters
- Common faults, their symptoms and cause.
- Fault location procedures and testing points
- Device adjustments

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in gaming and games equipment as described in 8) and including:

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A	Using methodical fault finding techniques.
B	Finding faults efficiently.
C	Replacing components without damage.
D	Providing written justification for the repairs.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in gaming and games equipment.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH111A Troubleshoot single phase input d.c. power supplies

UEENEEH112A Troubleshoot digital sub-systems

UEENEEH113A Troubleshoot amplifiers in an electronic apparatus

UEENEEH115A Develop software solutions for microcontroller based systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to finding and repairing at least four faults in two different types of gaming equipment.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH121A Fault find and repair high volume office equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair in high volume photo copiers (40 to 80 ppm), fax machines and the like. The unit encompasses safe working practices, interpreting electrical and mechanical diagrams, applying knowledge of office equipment to logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to

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License to practice **3)**

regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, cords and specifications

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Prerequisite Unit(s) **4)**

UEENEEH1 03A Repair business equipment faults

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation, work supervisor and customer to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of office equipment and using measurements of operating parameters and built-in fault indicators referenced to manufacturer’s specifications.
	2.5	Equipment components are dismantled where necessary and parts stored to protect them against loss or damage.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Faulty components are readjusted or replace in accordance with established procedures.
	2.8	Effectiveness of the repaired component is tested in accordance with established procedures.
	2.9	Apparatus is reassembled, finally tested and prepared for return to customer.
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.11	Fault finding and repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Written justification is made for repairs to apparatus including components and materials used.
	3.4	Acceptance that the reported fault(s) have been repaired is sought from an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in high volume office equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH121A High volume office equipment fault finding and repair

Evidence shall show an understanding of high volume office equipment fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Copier/printer software functions and configuration

- Copier/printer software functions and configuration options
- Device driver software installation and configuration
- Available user function
- Diagnostic software functions and their use
- Fault identification and repair

T2. Business machine transducers

- Function of transducers encompassing:
  - Linear position & velocity
  - Angular position measurement
  - Angular velocity measurement
  - Temperature sensors
  - Humidity sensors
  - Current sensors
  - Piezo sensors
- Temperature sensors types, operating principles and applications - thermocouples, resistance temperature detectors (RTD), thermistors, bimetal temperature sensors and the like.
- Optoelectronics device types, operating principles and applications - photo resistors, photodiodes, phototransistors, LASCR, photovoltaic devices, optocouplers, lasers and the like.

T3. High volume business machine functions and faults

- Operating features of electric motors, relays and solenoids, clutches and tachometers
- Function and operation of feed mechanisms, drive-trains and cleaning processors
- Input accessories, their function and operating principle encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

  - paper trays
  - high capacity bins
  - document feeders
  - duplex unit
  - manual bypass
  - coin boxes
  - card readers
  - raster image processing unit
- Output accessories, their function and operating principle encompassing:
  - sorters
  - staplers
  - collators
  - folders
  - stackers
- fault identification and repair
  - machine faults
  - line faults

T4. Colour photocopiers operating principles

- Principles of colour and colour separation encompassing:
  - Effects of light on the eye
  - Colour principles
  - Colour separation
  - Colour mixing processes
  - Colour Wheel
- Colour separation in colour photocopying encompassing:
  - Three scan process
  - Four scan process
  - Under colour removal
- Principles of colour photocopying
  - Reflected light paths
  - Block diagrams of photocopiers
  - Principles of operation
- Scanning processes of colour photocopiers encompassing:
  - CCD
  - Pre amps
  - Auto gain
  - Image Processing Unit
  - Laser unit

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REQUIRED SKILLS AND KNOWLEDGE

- Exposure processes
- Printing processes of colour photocopiers encompassing:
  - Laser diode unit
  - Polygon mirrors
  - Laser synchronising and detector encompassing:
  - Cylindrical lens
- Routine maintenance and servicing encompassing:
  - Optics
  - Paper feeds
  - Developer unit
  - Drum unit
  - Belts and rollers
  - Fusing unit
  - fault identification and repair
  - machine faults
  - line faults

T5. Facsimile machine operating principles

- Sub-system components (i.e. functional blocks) operating parameters encompassing:
  - CCITT standards
  - analogue and digital transmissions
  - transmission process
  - phases of facsimile calls
- Scanning operations encompassing:
  - single photosensor
  - CCD Operations
  - area image sensors
  - lighting systems
  - optical systems
- Signal processing encompassing:
  - picture reduction
  - modems
- Printing processes encompassing:
  - thermal
  - plain paper
  - carbon transfer
  - ink jet
- Dialing parameters encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- pulse (decadic) dialing
- DTMF
- manual dial
- blind dial, line and dial detect
- redial and listen to dial

- Coding systems encompassing:
  - data compression
  - Modified Hauffman (MH) systems
  - Modified Read (MR) systems
  - Modified Read (MMR) systems
  - “K” factor
  - Error Correction Modes (ECM)
- Operational principles encompassing:
  - transmission
  - reception
  - copying
- Installation, operation, maintenance and servicing procedures encompassing:
  - disassembly and assembly
  - consumable replacement
  - cleaning
  - fault identification and repair
  - machine faults
  - line faults
- Facsimile services encompassing:
  - fax stream
  - duet

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in high volume office equipment as described in 8) and including:

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A	Using methodical fault finding techniques.
B	Finding faults efficiently.
C	Remove/adjusting/replacing components without damage.
D	Testing equipment operation.
E	Providing written justification for the repairs and obtain acceptance of repairs.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in high volume office equipment.

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Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH112A Troubleshoot digital sub-systems

UEENEEH113A Troubleshoot amplifiers in an electronic apparatus

UEENEEH115A Develop software solutions for microcontroller based systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by finding and repairing at least four faults in a high volume (40 to 80 ppm) copier and work group Fax machine (12 ppm).

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH122A Fault find and repair remote control apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair in remote control apparatus and devices. The unit encompasses safe working practices, interpreting circuit diagrams, applying knowledge of remote control to logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components
UEENEEH111A	Troubleshoot single phase input d.c. power supplies
UEENEEH112A	Troubleshoot digital sub-systems

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Prerequisite Unit(s)

4)

UEENEEH113A	Troubleshoot amplifier circuits
UEENEEH138A	Fault find and repair complex power supplies

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation, work supervisor and customer to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in

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ELEMENT		PERFORMANCE CRITERIA	
			accordance with established procedures and checked for correct operation and safety.
2	Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.3	Fault finding is approached methodically drawing on knowledge of remote control apparatus using measured and calculated values of operating parameters and referenced to manufacturer's specifications.
		2.4	Equipment components are dismantled where necessary and parts stored to protect them against loss or damage.
		2.5	Faulty components are rechecked and their fault status confirmed.
		2.6	Faulty components are readjusted or replace in accordance with established procedures.
		2.7	Effectiveness of the repaired component is tested in accordance with established procedures.
		2.8	Apparatus is reassembled, finally tested and prepared for return to customer.
		2.9	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.10	Fault finding and repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in

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ELEMENT	PERFORMANCE CRITERIA	
		accordance with established procedures.
	3.3	Written justification is made for repairs to apparatus including components and materials used.
	3.4	Acceptance that the reported fault(s) have been repaired is sought from an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in remote control apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH122A Hand held remote control units

Evidence shall show an understanding of hand held remote control unit fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Remote control requirements

- Specifications
- multiple systems
- code formats
- bit sync
- system address
- commands, timing (clock accuracy)
- modulation system
- infrared system
- transmission errors
- methods used to reduce battery power
- key scanning and displays

T2. Data monitoring

- Points
- timing and amplitude specifications
- triggering of serial data
- data/graticule alignment
- identify and decode start bits
- system address bits, command bits
- stop bits
- load and other bits

T3. Remote control measurements

- battery voltage range, stand-by current and transmit current
- DC voltage and waveforms on IC pins
- Frequencies

T4. System controller requirements including remote, local, main housekeeping.

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REQUIRED SKILLS AND KNOWLEDGE

T5. Methods of inter-chip data communications

T6. Fault identification and repair

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence

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decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in remote control apparatus as

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described in 8) and including:

A Using methodical fault finding techniques.

B Finding faults efficiently.

C Remove/adjusting/replacing components without damage.

D Testing equipment operation.

E Providing written justification for the repairs and obtain acceptance of repairs.

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing fault in remote control apparatus

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Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH112A Troubleshoot digital sub-systems

UEENEEH113A Troubleshoot amplifiers in an electronic apparatus

UEENEEH115A Develop software solutions for microcontroller based systems

UEENEEH138A Fault find and repair complex power supplies

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to finding and repairing at least four faults in two different types of remote control devices.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH123A Fault find and repair microwave heating apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair in microwave heating apparatus. The unit encompasses safe working practices, interpreting circuit diagrams, applying knowledge of microwave heating apparatus to logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to

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License to practice **3)**

regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in

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this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to find and repair faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The nature of the fault is obtained from documentation, work supervisor and customer to establish the scope of work to be undertaken.

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ELEMENT	PERFORMANCE CRITERIA	
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of microwave heating apparatus using measured and calculated values of operating parameters and referenced to manufacturer's specifications.
	2.5	Equipment components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Faulty components are readjusted or replace in accordance with established procedures.
	2.8	Effectiveness of the repaired component is tested in accordance with established procedures.
	2.9	Apparatus is reassembled, finally tested and prepared for return to customer.

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ELEMENT	PERFORMANCE CRITERIA	
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.11	Fault finding and repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Written justification is made for repairs to apparatus including components and materials used.
	3.4	Acceptance that the reported fault(s) have been repaired is sought from an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in microwave heating apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH123A Microwave heating apparatus

Evidence shall show an understanding of microwave heating apparatus fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Propagation of electromagnetic waves through the atmosphere, microwave frequency bands

T2. Microwave heating devices encompassing:

- Components
- Operating parameters and constraints
- Measurements, test equipment and testing techniques

T3. EMI/EMC, generation, suppression and reduction.

Evidence Guide

EVIDENCE GUIDE

9)

Overview of Assessment **9.1)**

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Critical aspects of evidence required to demonstrate competency in this unit	**9.2)**
Context of and specific resources for assessment	**9.3)**
Method of assessment	**9.4)**
Concurrent assessment and relationship with other units	**9.5)**

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to finding and repairing at least four faults in two different microwave heating devices.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH124A Repair predictable faults in audio components

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers identifying predictable faults and repairing by replacement of subassemblies in audio components. The unit encompasses safe working practices, interpreting circuit diagrams and service manuals, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEH102A	Repairs basic electronic apparatus faults by replacement of components
UEENEEH111A	Troubleshoot single phase input d.c. power supplies
UEENEEH112A	Troubleshoot digital sub-systems

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Prerequisite Unit(s)

4)

UEENEEH113A	Troubleshoot amplifier circuits
UEENEEH138A	Fault find and repair complex power supplies

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to repair audio components.	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment, testing devices and service manual needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.

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ELEMENT		PERFORMANCE CRITERIA	
2	Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Fault finding is approached methodically drawing on knowledge of audio components and circuit using measured and calculated values of apparatus parameters and/or with reference to manufacturer's service manual.
		2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
		2.6	Faulty components are rechecked and their fault status confirmed.
		2.7	Repairs are made in accordance with manufacturer's service guide and supervisor's instructions.
		2.8	Apparatus is reassembled and tested for safety and functionality in preparation for return to the customer.
		2.9	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.10	Repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Completion and report repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Written justification is made for repairs to apparatus.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with

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ELEMENT	PERFORMANCE CRITERIA
	established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and carrying out repairs of predictable faults in audio components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH124A Audio component predictable fault repair

Evidence shall show an understanding of audio component predictable fault repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Audio and video component functional controls

- Types of components and their functional controls
- Function set up procedures
- Testing

T2. Audio reproduction, electronic components

- Preamplifiers amplifier encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Power and integrated amplifiers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Graphic equalizers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Component interconnections

T3. Technical manuals and catalogues

- Typical format
- How to read and apply information
- Audio components applications

T4. Audio component repair basics

- Sub-system components (i.e. functional blocks) and their operating parameters
- Common faults, their symptoms and cause.
- Fault location procedures and testing points
- Device adjustments

  Note. Examples of audio components are preamplifiers amplifier, power and integrated amplifiers, graphic equalizers and the like.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are

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included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out repairs of predictable faults in audio components as described in 8) and including:

A Using methodical fault finding techniques.

B Finding faults efficiently.

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C	Replacing components without damage.
D	Providing written justification for the repairs.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out repairs of predictable faults in audio components.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to carrying out repairs to two different audio components each with any three predictable faults.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electronics

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UEENEEH127A Set up and adjust commercial radio frequency (RF) transmission and reception systems

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the setting-up and adjusting of RF transmission and reception systems for optimum performance. It encompasses safe working practices, signal testing and analysis, adjusting equipment, following procedures and documenting.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH102A	Repair basic electronic apparatus faults by replacement of components

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Prerequisite Unit(s)

4)

UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH139A	Troubleshoot basic amplifier circuits
UEENEEH146A	Solve fundamental electronic communications system problems
UEENEEH172A	Fault find and repair communication systems

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set-up and adjust commercial radio frequency (RF) transmission and reception systems	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	Measurement parameters are identified by reviewing transmission/reception requirements and equipment manufacturer’s instructions.
	1.6	Tools, equipment and testing devices needed

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ELEMENT	PERFORMANCE CRITERIA	
		for the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.7	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	1.9	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
2 Set-up and adjust commercial radio frequency (RF) transmission and reception systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular control system.
	2.3	Measuring instruments are set up and adjusted in accordance with transmission/reception requirements and equipment manufacturer's instructions.
	2.4	Adjustments are made to provide optimum transmission/reception performance within regulatory requirements.
	2.5	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.7	Setting-up is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA
3 Completion and report set-up and adjustment activities.	3.1 OHS risk control work completion measures and procedures are followed.
	3.2 Work site is cleaned and made safe in accordance with established procedures.
	3.3 Adjustment settings are documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting-up and adjusting commercial radio frequency (RF) transmission and reception systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH127A Commercial radio frequency (RF) transmission and reception systems

Evidence shall show an understanding of commercial radio frequency (RF) transmission and reception systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Electronic communications, transmission lines

- Time domain reflectometry measurements
- Radio frequency characteristics of transmission lines
- Losses in transmission lines
- Radiation characteristics of antennae
- Directional antennae
- Antennae matching
- UHF and microwave antennae

T2. Electronic communications, antennas and wave propagation

- Antenna fundamentals - characteristics of radio waves, antenna operation, antenna reciprocity and the basic antenna.
- Antenna types, feature and characteristics encompassing:
  - Dipole antennas and characteristics - radiation resistance, dipole length, antenna resistance, antenna Q and bandwidth, conical antennas, dipole polarisation, radiation patterns and directivity, antenna gain and folded dipoles
  - Marconi ground-plane vertical antenna features and characteristics - radiation pattern, ground plane radials and counterpoise, radiation resistance, antenna length and directivity,
  - UHF and microwave antennas
  - Relationship between directivity and gain
  - Antenna arrays - parasitic arrays and driven arrays
  - Impedance matching
- Radio wave propagation characteristics - optical characteristic, propagation through space
- Calculation of received power
- Antenna selection and location

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REQUIRED SKILLS AND KNOWLEDGE

- Transmission lines

T3. Advanced electronic testing and measuring devices and techniques

- Test/measuring devices and their application - frequency counters, and synthesisers, spectrum analysers, noise and distortion meters and RF communications service monitor.
- Connection of test/measuring devices into a circuit encompassing:
  - safety procedures
  - loading and matching
  - storage and delay
  - circuit arrangement of test/measuring devices
- Taking and interpreting readings
- Notion of decibels including dBm, dBr, dBu, dBo

T4. Electronic communications, antennas and wave propagation

- Antenna fundamentals - characteristics of radio waves, antenna operation, antenna reciprocity and the basic antenna.
- Antenna types, feature and characteristics encompassing:
  - Dipole antennas and characteristics - radiation resistance, dipole length, antenna resistance, antenna Q and bandwidth, conical antennas, dipole polarisation, radiation patterns and directivity, antenna gain and folded dipoles
  - Marconi ground-plane vertical antenna features and characteristics - radiation pattern, ground plane radials and counterpoise, radiation resistance, antenna length and directivity,
  - UHF and microwave antennas
  - Relationship between directivity and gain
  - Antenna arrays - parasitic arrays and driven arrays
  - Impedance matching
- Radio wave propagation characteristics - optical characteristic, propagation through space
- Calculation of received power
- Antenna selection and location
- Transmission lines

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set-up and adjust commercial radio frequency (RF) transmission and reception systems as described in 8) and including:

A	Identifying measurement parameters.
B	Setting-up and adjusting in accordance with transmission/reception requirements and equipment manufacturer's instructions.

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C	Documenting adjustment settings with established procedures.
D	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to commissioning commercial radio frequency (RF) transmission and reception systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

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that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to setting-up and adjusting a representative range of two different types of commercial radio frequency (RF) transmission and reception systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH128A Install and test microwave antennae and waveguides

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and testing of waveguides and antennae for microwave communications systems. It encompasses working safely and to installation standards, matching hardware and accessories with that specified for a given location, installation techniques, pre commission adjustment of antennas and waveguides and following instruction and procedures.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training or approved training programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and test microwave antennae and waveguides.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines.
	1.2	Established OHS risk control measures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are reported and advise on risk control measures are sought from the work supervisor.

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ELEMENT	PERFORMANCE CRITERIA	
	1.4	The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor and/or other appropriate person to ensure the work is co-ordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established routines.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Install microwave antennae and waveguides.	2.1	Established OHS risk control measures for carrying out the work are followed.
	2.2	Circuits/components are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Antennas are installed in their specified locations and within limitation imposed by regulation.
	2.4	Hardware and accessories are installed straight and square in the required locations and within acceptable tolerances.
	2.5	Cables and conductors are terminated at accessories in accordance with manufacture's and job specifications and regulatory requirements
	2.6	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.7	The installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Test microwave antennae and waveguides and report.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Pre-commissioning adjustments are made to the installation and the system to optimise performance in accordance with system specification.
	3.3	Work site is cleaned and made safe in accordance with established procedures.
	3.4	Work supervisor is notified of the completion of the installation work in accordance with established routines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and testing microwave antennae and waveguides.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH128A Microwave antennae and waveguides installation and testing

Evidence shall show an understanding of microwave antennae and waveguides installation and testing, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Electronic communications, microwave antennas and wave guide fundamentals

T2. Antenna and wave guide principles and components

T3. Installation techniques for microwave communication systems

T4. Setting up and testing techniques for microwave communication systems

T5. Electronic safe working practices

- Risk management and assessment of risk encompassing:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:
- Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electronic systems and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage encompassing:
  - Parts of an electronic systems and equipment that operate at high-voltage,
  - The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
  - Control measures used for dealing with the hazards of high-voltage.
- Risks and control measures associated with low voltage encompassing:
  - Risks associated with installation, fault finding, maintenance and repair.
  - Control measures before, while and after working on electronic systems or equipment
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.

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REQUIRED SKILLS AND KNOWLEDGE

- Risks and control measures associated with the high levels of radiation encompassing:
  - RF hazards
  - Maximum exposure levels to RF
  - Maximum exposure to microwave radiation
- Optical fibre safety encompassing:
  - Coherent optical sources and joining procedures
  - Laser safety class 3a devices or their replace
- Safety, selection, use, maintenance and care of test equipment encompassing:
  - Safety characteristics of electrical testing devices,
  - Chemical cleaning solvents, glues and joining wastes used in electronics,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

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Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and test microwave antennae and waveguides as described in 8) and including:

A	Reading and interpreting drawings of circuit arrangements and component locations.
B	Installing and securing antenna, waveguide hardware and accessories accurately.
C	Terminating cable and conductors correctly.

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D	Pre commission adjusting for optimum performance.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing microwave and antennae and waveguides.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

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that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by installing, connecting and adjusting any microwave antennae and waveguides consisting of antennas, rectangular and curved sections, T sections, joints and couplers and on at least two occasions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH129A Fault find and repair navigation systems

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repair of faults in navigation systems. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical diagnostic methods and knowledge of navigation system components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH1	Repair basic electronic apparatus faults by

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Prerequisite Unit(s)

4)

02A	replacement of components
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus
UEENEEH139A	Troubleshoot basic amplifier circuits
UEENEEH146A	Solve fundamental electronic communications system problems
UEENEEH172A	Fault find and repair communication systems

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed

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ELEMENT		PERFORMANCE CRITERIA	
			to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2	Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Logical diagnostic methods are applied to diagnose navigation system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
		2.5	Suspected fault scenarios are tested as being the source of system problems.
		2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.
		2.7	Faults in the electronic components of the system are rectified to raise navigation system to its operation standard.
		2.8	System is tested to verify that the system operates as intended and to specified requirements.
		2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
		2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.

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ELEMENT	PERFORMANCE CRITERIA	
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report fault diagnosis and rectification activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in navigation systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH129A **Navigation systems**

Evidence shall show an understanding of navigation system fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Sub-system components (i.e. functional blocks) and their operating parameters

T2. Environment factors effecting system performance

T3. Typical faults, their symptoms and cause.

T4. Fault diagnosis procedures and testing

T5. Component replacement

T6. Sub-system adjustments

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in navigation systems as described in 8) and including:

A	Applying logical diagnostic methods.
B	Using fault scenarios to test the source of system faults.
C	Identifying faults and competency needed to rectify them.
D	Rectifying faults in system electronics.
E	Verifying that the system operates correctly.
F	Documenting fault rectification.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed item

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in navigation systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by finding and repairing at least four faults system faults across a representative range of electronic navigation systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH130A Fault find and repair satellite-based surveillance and observation systems

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repair surveillance and observation systems. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of surveillance system components, rectify faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH1	Repair basic electronic apparatus faults by

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Prerequisite Unit(s)

4)

02A	replacement of components
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus
UEENEEH139A	Troubleshoot basic amplifier circuits
UEENEEH146A	Solve fundamental electronic communications system problems
UEENEEH172A	Fault find and repair communication systems

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to find and repair faults.	1.1	OHS procedures for a given work area are obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		1.4	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel.
		1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2	Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Logical diagnostic methods are applied to diagnose satellite-based surveillance and observation system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
		2.5	Suspected fault scenarios are tested as being the source of system problems.
		2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.
		2.7	Faults in the electronic components of the system are rectified to raise satellite-based surveillance and observation system to its operation standard.
		2.8	System is tested to verify that the system operates as intended and to specified requirements.
		2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
		2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in satellite-based surveillance and observation systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH130A Satellite-based surveillance and observation systems

Evidence shall show an understanding of satellite-based surveillance and observation system fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Types of satellite systems and sub-systems

T2. Earth station locality and antenna parameters

T3. Link specifications and link calculations

T4. Base band signalling processes

T5. Modulation and system access

T6. Sub-system components (i.e. functional blocks) and their operating parameters

T7. Environment factors effecting system performance

T8. Typical faults, their symptoms and cause.

T9. Fault diagnosis procedures and testing

T10. Component replacement

T11. Sub-system adjustments

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Fault find and repair satellite based surveillance and observation systems as described in 8) and including:

A	Applying logical diagnostic methods.
B	Using fault scenarios to test the source of system faults.
C	Identifying faults and competency needed to rectify them
D	Rectifying faults in system electronics.

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E	Verifying that the system operates correctly.
F	Documenting fault rectification.
G	Dealing with unplanned events by drawing on essential k skills to provide appropriate solutions incorporated in a h with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in satellite based surveillance and observation systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is

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expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by fault finding and repairing at least four faults system faults in a representative range of electronic satellite-based surveillance and observation systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH131A Fault find and repair radar apparatus and systems

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repairing radar apparatus and system. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of radar system components, rectify faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH1	Repair basic electronic apparatus faults by

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Prerequisite Unit(s)

4)

02A	replacement of components
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus
UEENEEH139A	Troubleshoot basic amplifier circuits
UEENEEH146A	Solve fundamental electronic communications system problems
UEENEEH172A	Fault find and repair communication systems

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to fault find and repair	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed

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ELEMENT		PERFORMANCE CRITERIA	
			to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2	Fault find and repair	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Logical diagnostic methods are applied to diagnose radar apparatus and systems faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
		2.5	Suspected fault scenarios are tested as being the source of system problems.
		2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.
		2.7	Faults in the electronic components of the system are rectified to raise radar apparatus and system to its operation standard.
		2.8	System is tested to verify that the system operates as intended and to specified requirements.
		2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
		2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.

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ELEMENT	PERFORMANCE CRITERIA	
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report fault find and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and fault finding and repairing radar apparatus and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH131A Radar apparatus and system fault finding and repair/ Radar apparatus and system?

Evidence shall show an understanding of Radar apparatus and system fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Electronic communications, secondary radar and related systems

- Secondary radar principles encompassing:
  - Role of secondary radar
  - Transponder operation
  - Operating principles
  - Signal processing
  - Pulse generation, transmission and detection
  - Mode generation, detection and response
  - Display symbol generation
  - Synchronisation with primary radar
  - Advantages over primary radar with respect to: clutter;
  - signal/noise ratio; transmit power required for operation
- Interfaces to other systems providing information for transmission of mode data encompassing:
  - Slaving/synchronisation to primary radar
  - Clutter reduction/elimination
  - Defruiting
  - Degarbling
  - Interfaces to other systems
  - Range/ducting effects
  - Advantages over primary radar
  - Power supplies and UPS
  - International standards
  - National Curriculum
  - Hot standby, cold standby
- Application of secondary radar systems- Traffic Collision Avoidance System

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REQUIRED SKILLS AND KNOWLEDGE

(TCAS), Selective Identification System (SIF), Air Traffic Control Radar Beacon System (ATCRBS), Instrument Landing System (ILS), Tactical Air Navigation (TACAN), Navigation Systems (VOR, GPS, DME), Radar Altimeter, Jamming, Electronic warfare, Second Time Round Returns (STRR), and Identification –friend or foe radar (IFF).

T2. Electronic communications, radar and sonar displays devices

- Types and their applications - CRT, Plasma, LCD, Monochrome, Colour, and Touch screen.
- Sub-system components (i.e. functional blocks) and their operating parameters encompassing:
  - EHT transformers
  - detectors
  - video distribution
  - time base generators
  - phase locked loops
  - microprocessors
  - memory devices
  - demodulators
  - focusing/deflection devices
  - delay lines
  - bleed resistors
  - HV generation
- Calibration testing and maintenance procedures
- Typical fault finding, their symptoms and cause

T3. Electronic communications, radar fundamentals

- Hazards and risk control measures
- Purpose and uses of radar
- Environmental conditions affecting radar
- Design factors which affect performance
- Propagation of electromagnetic waves
- Pulse forming circuits
- Typical radar transmitter encompassing:
  - limitations and applications of each type
- Typical radar receivers encompassing:
  - Sub-system components (i.e. functional blocks) and their operating parameters
  - limitations and applications
- Radar antennae encompassing:
  - Types, application and radiation patterns - parabolic, phased array, log periodic, and cos q

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REQUIRED SKILLS AND KNOWLEDGE

- antenna gain
- efficiency
- length and height factors
- Microwave techniques, devices and applications encompassing:
  - oscillators
  - amplifiers
  - modulators and demodulators
  - mixers and detectors
- Types and characteristics of various radar systems

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Fault find and repair radar apparatus and systems as described in 8) and including:

A Applying logical diagnostic methods.

B Using fault scenarios to test the source of system faults.

C Identifying faults and competency needed to rectify them.

D Rectifying faults in system electronics.

E Verifying that the system operates correctly.

F Documenting fault rectification.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

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Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in radar apparatus and systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by fault finding and repairing at least four faults system faults in a representative range of electronic radar apparatus and systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH132A Fault find and repair global positioning systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repairing global positioning system. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of GPS system components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of

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License to practice **3)**

training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus
UEENEEH139A	Troubleshoot basic amplifier circuits

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Prerequisite Unit(s) **4)**

UEENEEH146A	Solve fundamental electronic communications system problems
UEENEEH172A	Fault find and repair communication systems

AND

UEENEEH114A	Solve problems in frequency dependent circuits
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills **5)**

will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to fault find and repair	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Fault find and repair	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is

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ELEMENT	PERFORMANCE CRITERIA	
		determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Logical diagnostic methods are applied to diagnose global positioning systems faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.
	2.7	Faults in the electronic components of the system are rectified to raise global positioning system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and fault finding and repairing global positioning systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH132A Global positioning system fault finding and repair

Evidence shall show an understanding of global positioning system fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Sub-system components (i.e. functional blocks) and their operating parameters

T2. Environment factors effecting system performance

T3. Typical faults, their symptoms and cause

T4. Fault diagnosis procedures and testing

T5. Component replacement

T6. Sub-system adjustments

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in global positioning systems as described in 8) and including:

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A	Applying logical diagnostic methods.
B	Using fault scenarios to test the source of system faults.
C	Identifying faults and competency needed to rectify them.
D	Rectifying faults in system electronics.
E	Verifying that the system operates correctly.
F	Documenting fault rectification.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in global positioning systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by fault finding and repairing at least four faults system faults in a representative range of electronic global positioning systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH133A Fault find and repair telecommunication apparatus and systems

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault find and repair telecommunication apparatus and systems. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of telecommunication system components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH1	Repair basic electronic apparatus faults by

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Prerequisite Unit(s)

4)

02A	replacement of components
UEENEEH111A	Troubleshoot single phase input d.c. power supplies
UEENEEH112A	Troubleshoot digital sub-systems
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH115A	Develop software solutions for microcontroller based systems
UEENEEH138A	Fault find and repair complex power supplies

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to fault find and repair	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to

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ELEMENT	PERFORMANCE CRITERIA	
		diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Fault find and repair.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Logical diagnostic methods are applied to diagnose telecommunication apparatus and system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.
	2.7	Faults in the electronic components of the system are rectified to raise telecommunication apparatus and system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding

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ELEMENT	PERFORMANCE CRITERIA	
		environment or services and using sustainable energy practices.
3 Complete and report fault find and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and fault finding and repairing in telecommunication apparatus and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH133A Telecommunication apparatus and system fault finding and repair

Evidence shall show an understanding of telecommunication apparatus and system fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Telephone system fundamentals

- The transmission of sound in a telephone system encompassing:
  - Function of telephone transmitters and receivers
  - Components and functions of the telephone
- Purpose of earthing and protection in a telephone system
- Customer Switching Systems encompassing:
  - Basic function
  - Difference between a key system and a PABX.
  - Advanced features
- Basic operations of System Distribution Frames (SDF)/Test Point Frames (TPF), power fail and line interface requirements (e.g. Indial, Rotary Groups, ISDN, Extension, Tie-line circuits)
- Types, purpose, use, and requirements of metering devices.
- Metering and installation arrangements of public/pay phones
- Installation methods and requirements encompassing:
  - Customer Switching Systems (CSS)
  - Interfacing equipment
  - Termination of CSS equipment
- Requirements for programming of CSS
- Hazard associated the electronic components of CSS encompassing:
  - Static discharge
  - Chemical damage
  - Mechanical damage
  - Electromagnetic Interference

T2. Telephone network facilities

- Network subsystems (i.e. functional blocks) components and operating parameters

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REQUIRED SKILLS AND KNOWLEDGE

- Switches within the network
- Customer accesses infrastructure
- System security

T3. Telecommunication earthing and protection

- Telecommunication overvoltage protection system
  - Operating principles
  - Overvoltage and surge/spike suppression protection techniques
  - Overvoltage protection devices
  - Installation of overvoltage protection systems
- Earthing protection system encompassing:
  - Components and arrangement of the MEN system
  - TELEX functional earth system
  - Telecommunication system earthing single and multi-storey
  - Communication earth system
  - Protective earth barriers for segregation, cable tray, duct and metal equipment enclosures
- Electrical interference encompassing:
  - Types – RFI, EMI
  - Sources of interference
  - Techniques in reducing interference
  - Earthing cable shields
- Earth testing instruments and procedures
- Safety issues to be considered with earthing and bonding

T4. PABX fundamentals

- Programming methods
- Configuration options
- Programming options

T5. Switches, hubs and routers

- Purpose and function
- Circuit configurations
- Connection arrangements
- System protocols

T6. Decoders

- Purpose and function
- Circuit configurations
- Connection arrangements
- System protocols

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REQUIRED SKILLS AND KNOWLEDGE

T1. Fault finding and repair

- Typical faults, their symptoms and cause
- Fault diagnosis procedures and testing
- Component replacement
- System adjustments

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries

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risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Fault find and repair telecommunication apparatus and systems as described in 8) and including:

A	Applying logical diagnostic methods.
B	Using fault scenarios to test the source of system faults.
C	Identifying faults and competency needed to rectify them.
D	Rectifying faults in system electronics.
E	Verifying that the system operates correctly.
F	Documenting fault rectification.
G	Dealing with unplanned events by drawing on essential knowle and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcome vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

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The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in telecommunication apparatus and systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by fault finding and repairing at least four faults system faults in a representative range of electronic telecommunication apparatus and systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH134A Fault find and repair electronic medical equipment

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repairing the electronic aspects of electronic medical equipment. The unit encompasses safe working practices, interpreting process and circuit diagrams, applying knowledge of medical process controls to logical diagnosis procedures, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH1	Repair basic electronic apparatus faults by

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Prerequisite Unit(s)

4)

02A	replacement of components
UEENEEH111A	Troubleshoot single phase input d.c. power supplies
UEENEEH112A	Troubleshoot digital sub-systems
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH115A	Develop software solutions for microcontroller based systems
UEENEEH138A	Fault find and repair complex power supplies

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH169A	Solve problems in basic electronic circuits

OR

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to fault find and repair.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to

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ELEMENT	PERFORMANCE CRITERIA	
		diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Fault find and repair	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Logical diagnostic methods are applied to diagnose in electronic medical equipment faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.
	2.7	Faults in the electronic components of the system are rectified to raise global positioning system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding

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ELEMENT	PERFORMANCE CRITERIA	
		environment or services and using sustainable energy practices.
3 Complete and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and fault finding and repairing in electronic medical equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH134A Electronic medical equipment fault finding and repair

Evidence shall show an understanding of electronic medical equipment fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Medical equipment principles

- Equipment categories, types, functions and operation
- Hazards and safety procedures
- Causes of failure
- Safety testing requirements and methods
- Categories and examples of medical equipment are:
  - Cardiovascular systems including: blood warmers, cardiac catheterisation systems, defibrillators,
  - electrocardiogram(ECG) machines, electrocardiogram(ECG) monitors, heart-lung machines, infusion
  - pumps, intra-aortic balloon pumps, pacemakers, syringe pump and cardiac output measurement
  - equipment.
  - Respiratory systems including: anaesthetic delivery and monitoring units, medical gases, oxygen concentrator, pulse oximeter, respiratory humidifier, respiratory support units and ventilators.
  - Neurological systems including: electroencephalograph (EEG recorder), electromyograph (EMG recorder) and intracranial pressure monitoring (ICP).
  - Renal systems including: haemodialysis machine, CVVH machine and peritoneal dialysis.
  - Medical imaging including: x-ray equipment, computerised axial tomography (CT scan), magnetic resonance imaging (MRI), nuclear medicine and diagnostic ultrasound equipment.
  - Physiological equipment including: blood pressure monitors, foetal cardio-tocograph, infant care systems, multiparameter systems, thermometry, telemetry, networking and patient warmers.
  - Miscellaneous equipment including: electrosurgery, electric stimulators, and endoscopy and laparoscopy systems, laser, operating microscopes, therapeutic

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REQUIRED SKILLS AND KNOWLEDGE

diathermy and ultra sound.

T2. Medical equipment, anatomy and physiology and infection control

- Nature of infection
- Control of microbial growth
- Infection control strategies
- Body systems

T3. Medical equipment safe working practices

- Risk management and assessment of risk encompassing:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with medical equipment, encompassing:
  - Infections
  - Toxic materials
  - Electrical components
  - Radiation
- Risks and control measures associated with working with medical equipment

T4. Fault finding and repair

- Typical faults, their symptoms and cause
- Fault diagnosis procedures and testing
- Component replacement
- Equipment adjustments

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment,

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such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

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- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Fault find and repair electronic medical equipment as described in 8) and including:

A	Applying logical diagnostic methods.
B	Using fault scenarios to test the source of system faults.
C	Identifying faults and competency needed to rectify them.
D	Rectifying faults in system electronics.
E	Verifying that the system operates correctly.
F	Documenting fault rectification...
G	Dealing with unplanned events by drawing on essential knowle and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcome vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in electronic medical equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by fault finding and repairing at least four faults system faults in four different types of a representative range of electronic medical equipment.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH135A Design custom electronic equipment installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design of home entertainment aspects of custom electronic installations and energy control systems. It encompasses developing control scenarios based on a design brief, negotiating with architect/designer, builder and client and the like, applying knowledge of electronic audio/video components and home theatre acoustics and relevant electrical installation regulation, developing design drawings and obtaining approval for final design.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits
UEENEEH105A	Verify functionality and compliance of custom electronic installations
UEENEEH106A	Assemble and set up fixed video/audio components and systems in buildings and premises

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 5 Writing 5 Numeracy 5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design custom electronic installations.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the proposed custom electronic installation is determined from the design brief or in consultations with appropriate person(s).
	1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop installation design.	2.1	Knowledge of audio/video components, home theatre acoustics and regulations is applied to the design.
	2.2	Alternative arrangements for the installation design are considered based on the requirements outlined in the design brief.
	2.3	Safety, functional and budgetary considerations are incorporated in the installation design.
	2.4	Installation design draft is checked for compliance with the design brief and regulatory requirements.
	2.5	Installation design is documented for submission to appropriate person(s) for approval.
	2.6	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for installation design.	3.1	Installation design is presented and explained to client and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing custom electronic installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH135A Custom electronic equipment installation design

Evidence shall show an understanding of custom electronic equipment installation design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Integrated audio systems

- Types of audio control and switching devices
- Types of surround sound systems
- Operation of system control circuits, including the remote device

T2. Video and display set up

- Projectors encompassing:
  - Aspect ratio
  - Screen size
  - Orientation
  - Throw distance, vertical elevation and horizontal orientation
- Direct view monitors adjustments

T3. Audio/video control equipment

- Types of control devices and their operating principles
- Control equipment arrangement in an audio/video system

T4. Technical standards, regulations and codes for extra-low voltage work

- Limitation imposed by regulations
- How to read and apply a standard
- Aspects of technical Standards that apply to extra-low voltage work

T5. Environmental and heritage awareness

- Purpose of environmental and heritage regulation
- Typical issues affecting electrotechnology services and systems
- Meeting requirements

T6. Acoustics, spatial treatment and sound reproduction

- Effects of room dimensions, spatial shape and surface textures on acoustics

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REQUIRED SKILLS AND KNOWLEDGE

- Ideal acoustic for specific purposes - speech, solo or small group music, rock music orchestral music, choral music, cinema and the like.
- Measuring room response
- Speaker placement and room response
- Room treatment methods to improve acoustic response
- Active methods to improve acoustic response

T7. Equipment installation design

- Requirements
- Limitations
- Procedures
- Documentation

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the

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most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a

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percentile graded result for the purpose of regulatory or licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design custom electronic installations as described in 8) and including:

A	Developing outlines of alternative designs.
B	Developing the design within the safety and functional requirements and budget limitations.
C	Documenting and presenting design effectively.
D	Successfully negotiating design alteration requests.
E	Obtaining approval for final design.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal

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learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing custom electronic installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by designing the entertainment aspects of a representative range of two custom electronic installations one of which shall incorporated dedicated home theatre.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH136A Design commercial video/audio installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design of video/audio facilities in meeting rooms, classrooms, studios, theatres, halls and the like. It encompasses applying knowledge of electronic audio/video components, acoustics and visual displays, analogue and digital communication, multimedia storage and reproduction, negotiating with clients and others and documenting design.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits
UEENEEH110A	Install commercial video/audio system components
UEENEEH137A	Program and commission commercial video/audio systems

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design commercial video/audio installations.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the proposed integrated installation is determined from the design brief or in consultations with appropriate person(s).
	1.4	Design development work is planned to meet scheduled timelines in consultation with others involved in the work.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop installation design.	2.1	Knowledge of audio/video components, acoustics and visual displays, analogue and digital communication, multimedia storage and reproduction is applied to designing the installation.
	2.2	Alternative arrangements for the installation design are considered based on the requirements outlined in the design brief.
	2.3	Safety, functional and budgetary considerations are incorporated in the installation design.
	2.4	Installation design draft is checked for compliance with the design brief and regulatory requirements.
	2.5	Installation design is documented for submission to appropriate person(s) for approval.
	2.6	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for installation design.	3.1	Installation design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing commercial audio/video installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH136A Commercial video/audio installation design

Evidence shall show an understanding of commercial video/audio installation design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Acoustics, spatial treatment and sound reproduction

- Effects of room dimensions, spatial shape and surface textures on acoustics
- Ideal acoustic for specific purposes - speech, solo or small group music, rock music orchestral music, choral music, cinema and the like.
- Measuring room response
- Speaker placement and room response
- Room treatment methods to improve acoustic response
- Active methods to improve acoustic response

T2. Environmental and heritage awareness

- Purpose of environmental and heritage regulation
- Typical issues affecting electrotechnology services and systems
- Meeting requirements

T3. Venue lighting for audio/video/live presentations

- Lighting types and colour
- Effects of direction of light
- Use of natural light
- Lighting levels and control

T4. Equipment installation design

- Requirements
- Limitations
- Procedures
- Documentation

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design commercial audio/video installations as described in 8) and including:

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A	Developing outlines of alternative designs.
B	Developing the design within the safety and functional requirements and budget limitations.
C	Documenting and presenting design effectively.
D	Successfully negotiating design alteration requests.
E	Obtaining approval for final design.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing commercial audio/video installations.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by designing two commercial audio/video installations of a representative range, one of which shall incorporated analogue and digital communication, multimedia storage and reproduction.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH137A Program and commission commercial video/audio systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers testing, adjusting and balancing of video/audio facilities in meeting rooms, classrooms, studios, theatres, halls and the like. The unit encompasses working safely and to specifications, measuring and adjusting necessary parameters to meet specified performance, working with clients and documenting and certifying set performance parameters.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

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Prerequisite Unit(s) **4)**

UEENEEH110A	Install commercial video/audio system components

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to commission commercial video/audio systems.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of programming and commissioning is determined from reports and other documentation and fro discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to program and commission are obtained in accordance with established procedures and checked for correct operation and safety.
2 Commission commercial video/audio systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Audio/video devices are checked for correct location and alignment.
	2.5	Functional settings are made for each audio/video apparatus in accordance with design specifications.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Audio/video system functions are tested in accordance with commissioning requirements.
	2.7	Sources of audio/video system anomalies are identified and corrected.
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.10	Commissioning activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report commissioning activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	‘As-installed’ audio/video system is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and programming and commissioning commercial audio/video systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH137A Commercial video/audio programming and commissioning

Evidence shall show an understanding of commercial video/audio programming and commissioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Purpose of commissioning

T2. Commissioning planning and documentation

T3. Initial tests and adjustments

T4. Commissioning procedures and documentation

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work

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environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control

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measures as specified in the performance criteria and range statement
    - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
    - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
    - Demonstrate an appropriate level of skills enabling employment
    - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
  - Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
    - Program and commission commercial audio/video systems as described in 8) and including:

A Setting apparatus functions.

B Testing system functions.

C Identifying and correcting function anomalies.

D Documenting ‘as-installed’ system correctly.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials

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to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to programming and commissioning commercial audio/video systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by commissioning of a representative range at least two different commercial audio/video systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH138A Fault find and repair complex power supplies

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of regulated and switch mode power supplies The unit encompasses safe working practices, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended for development of competency in either entry-level employment based programs incorporated in approved contracts of training or other approved training programs. It may also be used to augment formally acquired competencies.

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at

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License to practice **3)**

voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH102A	Repair basic electronic apparatus faults by replacement of components

AND

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Prerequisite Unit(s) **4)**

UEENEEH114A	Solve problems in frequency dependent circuits
OR	
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
OR	
UEENEEH169A	Solve problems in basic electronic circuits
OR	
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEH111A	Troubleshoot single phase input d.c. power supplies

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills **5)**

qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults in complex power supplies.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Find and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and

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ELEMENT	PERFORMANCE CRITERIA	
		when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of complex power supplies and circuits using measured and calculated values of power supply parameters.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Materials required for the repair work are sourced and obtained in accordance with established procedures.
	2.8	Effectiveness of the repair is tested in accordance with established procedures.
	2.9	Apparatus is reassembled, finally tested and prepared for return to customer.
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.11	Fault finding and repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Completion and report repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Written justification is made for repairs to apparatus.
	3.4	Work completion is documented and an

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ELEMENT	PERFORMANCE CRITERIA
	appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in complex power supplies.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH138A Complex power supplies fault finding and repair

Evidence shall show an understanding of complex power supplies fault finding and repair to an extent indicated by the following aspects:

T1. Series regulation

- Operating principles
- Operation and specifications of three terminal regulators
- Internal protection for three terminal regulators
- Increasing the output current of a three terminal regulator
- Increasing the output voltage of a three terminal regulator
- The three terminal regulator as a current regulator
- Heat sink selection
- Fault finding a series regulator

T2. Series regulator employing closed loop control

- Components selection
- Basic discrete circuits
- Closed loop control of regulators
- Error amplification
- The BJT used as an error amplifier
- Operation of a series BJT regulator employing closed loop control
- Typical faults
- Crowbar protection
- Current limiting
- Verification of circuit operation
- Fault finding a series BJT regulator employing closed loop control

T3. Switching regulation - basic principles

- Components selection
- Basic principles of switching regulators
- Pulse width modulation (PWM) and frequency modulation
- Switching regulator configurations: step-up, step-down, inverting and isolating
- Circuit analysis of each regulator, constructed from a BJT, inductor, diode and

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REQUIRED SKILLS AND KNOWLEDGE

filter capacitor

- Electromagnetic radiation (EMR) and noise emissions
- Ferrite cores
- Verification of circuit operation
- Heat sink selection

T4. Switching regulation - closed loop control of output

- Generic block diagram of a switching regulator employing feedback to control output voltage
- Circuit operation
- Typical faults
- Emerging technologies in IC regulators
- Verification of load regulation

T5. Off-line switching regulators

- Isolation and safety requirements
- Specialised safety equipment
- Operation of flyback (buck) and forward (boost) converters
- Typical faults
- Verification of circuit operation

T6. OH&S

- Safe working practices and relevant Standards, Codes and Regulations

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best

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utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline,

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work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in complex power supplies as described in 8) and including:

A	Using methodical fault finding techniques.
B	Finding faults efficiently.
C	Replacing components without damage.
D	Providing written justification for the repairs.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment **9.3)**

This unit should be assessed as it relates to normal work practice

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using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in complex power supplies.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to finding and repairing a range of faults in a representative range of regulated power supply and a switch mode power supply.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH139A Troubleshoot basic amplifier circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers determining correct operation of basic amplifier circuits. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in basic amplifier circuits.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended for development of competency in either entry-level employment based programs incorporated in approved contracts of training or other approved training programs. It may also be used to augment formally acquired competencies.

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at

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License to practice **3)**

voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH102A	Repair basic electronic apparatus faults by replacement of components

AND

UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus

OR

UEENEEG1	Solve problems in low voltage a.c. circuits

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Prerequisite Unit(s) **4)**

02A

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to troubleshoot basic amplifiers.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve basic amplifier circuit problems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of basic amplifiers using measured and calculated values of parameters.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Fault finding activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using

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ELEMENT	PERFORMANCE CRITERIA	
		sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to troubleshooting problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and troubleshooting basic amplifiers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH139A Basic amplifier circuit troubleshooting

Evidence shall show an understanding of basic amplifier circuit troubleshooting, applying safe working practices and relevant Standards Codes and Regulations to an extent indicated by the following aspects:

T1. Introduction to Amplifiers

- Purpose of amplifiers
- Introduction to black box model of amplifier
- Decibels, engineering terms and formulae
- Measurement of gain and frequency response

T2. Amplifier Terminal Characteristics

- Amplifier types and transfer characteristics
- Ideal amplifier transfer characteristics

T3. Practical amplifiers

- Practical amplifier terminal characteristics
- Input and output resistance calculations based on voltage measurements

T4. Operational amplifiers - Introduction

- Advantages of operational amplifiers
- Schematic symbol
- Open loop configuration
- Input and output resistance
- Gain bandwidth product
- Open loop amplifier operation
- Comparator circuit
- Circuit verification of operational amplifier configured as a comparator

T5. Operational amplifiers – Inverting Amplifier

- The need for and effects of negative feedback
- Inverting operational amplifier circuit configuration
- Inverting operational amplifier gain calculations
- Summing inverting operational amplifier gain calculations
- Circuit verification of operational amplifier gain

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REQUIRED SKILLS AND KNOWLEDGE

T6. Operational amplifiers – Non-inverting amplifier

- Non-inverting operational amplifier circuit configuration
- Non-inverting operational amplifier gain calculations
- Circuit verification of non inverting operational amplifier gain
- Voltage follower circuit configuration
- Voltage follower circuit gain
- Circuit verification of voltage follower

T7. Operational amplifiers – Differential Amplifier

- The differential amplifier
- Schematic circuit of differential amplifier using an operational amplifier
- Differential amplifier gain calculations
- Circuit verification of differential amplifier operation
- The Schmitt trigger
- Circuit verification of Schmitt trigger circuit

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside

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the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Troubleshoot basic amplifiers as described in 8) and including:

A	Using methodical problem solving methods.
B	Taking measurements correctly and accurately.
C	Calculating parameters correctly and accurately.
D	Providing solution to amplifier circuit problems.
E	Providing written justification for the solutions to problems.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials

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to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to troubleshooting basic amplifiers.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to troubleshooting amplifiers for at least three types of amplifier configurations.

The troubleshooting must be demonstrated on three types of faults.

Note:

1. The range of faults may include: distortion, excessive power consumption, low gain and limited frequency responses.

2. Troubleshooting may involve the modification of an existing amplifier configuration to comply with a specified function and operating parameters.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH140A Fault find and repair sonar apparatus and systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and the repair of faults in sonar apparatus and system. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of sonar system components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH112A	Troubleshoot digital sub-systems
UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH115A	Develop software solutions for microcontroller based systems
UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus
UEENEEH172A	Fault find and repair communication systems

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to fault find and repair faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the

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ELEMENT	PERFORMANCE CRITERIA	
		work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Fault find and repair	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose sonar apparatus and system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.
	2.7	Faults in the electronic components of the system are rectified to raise sonar apparatus

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ELEMENT	PERFORMANCE CRITERIA	
		and system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report fault find and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and fault find and repairing sonar apparatus and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH140A Sonar apparatus and system fault finding and repair

Evidence shall show an understanding of sonar apparatus and systems fault finding and repair, applying safe working practices and relevant Standards Codes and Regulations to an extent indicated by the following aspects:

T1. Electronic communications, sonar system operating principles

- The purpose and application of sonar systems
- Sonar equipment encompassing:
  - Types and their applications
- Sub-system components (i.e. functional blocks) and their function encompassing:
  - Transducer
  - Input amplifier
  - Sonar interface unit
  - Beam forming network (transmit / receive)
  - Signal processing
  - Own Doppler nullification
  - Display system
  - Headset
  - Interfaces
  - Transmitter
  - T/R Switch
  - Timer/Timing
- Sonar operating parameters
- Sonar transmission characteristics

T2. Electronic communications, sonar transducers and arrays

- Hazards and risk control measures
- Transducer types, their operating principles and parameters
- Transducer array encompassing:
  - Types and their construction
  - Applications

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REQUIRED SKILLS AND KNOWLEDGE

- Transducer hull outfits
- Beam forming principles and requirements
- Transducer installation and operational maintenance

T3. Electronic communications, sonar measurement and set up

- Sonar parameters and measurements
- Sonar physical parameters
- Constraints and Consequences

T4. Electronic communications, radar and sonar displays devices

- Types and their applications - CRT, Plasma, LCD, Monochrome, Colour, and Touch screen.
- Sub-system components (i.e. functional blocks) and their operating parameters encompassing:
  - EHT transformers
  - detectors
  - video distribution
  - time base generators
  - phase locked loops
  - microprocessors
  - memory devices
  - demodulators
  - focusing/deflection devices
  - delay lines
  - bleed resistors
  - HV generation
- Calibration testing and maintenance procedures
- Typical fault finding, their symptoms and cause

T5. Advanced electronic (sonar) testing and measuring devices and techniques

- Test/measuring devices and their application - frequency counters, and synthesisers, spectrum analysers, noise and distortion meters and RF communications service monitor.
- Connection of test/measuring devices into a circuit encompassing:
  - safety procedures
  - loading and matching
  - storage and delay
  - circuit arrangement of test/measuring devices
- Taking and interpreting readings
- Notion of decibels including dBm, dBr, dBu, dBo

T6. Fault finding and repair

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REQUIRED SKILLS AND KNOWLEDGE

- Typical faults, their symptoms and cause
- Fault diagnosis procedures and testing
- Component replacement
- Equipment adjustments

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

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Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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- Fault find and repair sonar apparatus and systems as described in 8) and including:

A	Applying logical diagnostic methods.
B	Using fault scenarios to test the source of system faults.
C	Identifying faults and competency needed to rectify them.
D	Rectifying faults in system electronics.
E	Verifying that the system operates correctly.
F	Documenting fault rectification.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in sonar apparatus and systems.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in sonar

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apparatus and systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by fault find and repairing at least four faults system faults in a representative range of electronic sonar apparatus and systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH141A Manage computer systems/electronics projects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the management of computer systems/ electronics projects involving management of safety, budget variation, personnel, resources, timelines and completion documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 6 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the scope of the projects.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Project deliverables and project objectives (as measurable outcomes) are established from project planning and other relevant documentation and from discussions with appropriate person(s).
	1.3	The "work breakdown structure" (WBS) is developed to identify component parts of the project.
	1.4	Major milestones and deliverables are identified.
	1.5	Resources needed to meet project outcome are established.
	1.6	Processes and procedures are developed for managing contract variations from discussions with appropriate person(s) and in accordance with contractual agreement.
	1.7	Risks are identified and project plan strategies devised to ensure that outcomes are achieved to the required standard of quality specified in the contract.
	1.8	A project plan is devised. The project plan typically includes: scope statement, WBS, cost estimates, proposed timeline and deliverables, required staff and other resources, key risks and their planned responses.
2 Manage computer systems/electronics/ projects.	2.1	OHS policies, procedures and programs are implemented and monitored.
	2.2	Achievement of project outcomes is delegated to appropriately competent person(s) involved in the project.
	2.3	Risk events are monitored and project plan strategies implemented to ensure that outcomes are achieved to the required standard of quality specified in the contract.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Procurement processes and procedures are monitored to ensure on time supply of equipment and materials and in accordance with organisation policy.
	2.5	Verification of the project technical design, modification, installation, and/or maintenance of system and equipment parameters is frequently made against specifications and established procedures.
	2.6	Project progress is monitored against schedule, quality requirements and budget.
	2.7	Conflict issues at the work site and between stakeholders, clients and regulators are identified and managed in accordance with established procedures.
	2.8	Variations are managed in accordance with agreed processes and in accordance with the contract.
	2.8	Project records are maintained and progress reports written and forwarded to all appropriate person(s).
3 Complete projects and document	3.1	Project outcomes are reviewed against original plan, implemented risk strategies, contract variations, safety record, and budget.
	3.2	Project completion acceptance is sought from appropriate person(s) and hand-over documented in accordance with organisation policy and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge of safe working practices and managing electronics/computer systems projects has been acquired.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH141A Computer systems/electronics project management

Evidence shall show an understanding of computer systems/electronics project management, applying safe working practices and relevant Standards Codes and Regulations to an extent indicated by the following aspects:

T1. Electronic/computer systems industry sector customs and practices

- Technical aspects of project planning and management encompassing:
  - Method of ensuring equipment meets specified performance requirements
  - Performance/cost benefit analysis
  - Equipment procurement
- Typical approaches to planning and management
- Successful planning techniques
- Best practice management methods and styles

T2. Defining project parameters - Project scope; Project stakeholders and clients; Project phases and the relationship between phases; Time requirements and limitations; Resource requirements and limitations; Quality requirements and limitations.

T3. Time management - time management concepts; standard practices for ensuring a project runs to time and the like.

T4. Financial management - Financial management concepts; Standard practices for managing project finances; Project budgets; Costs, variations and estimations; Invoicing against project phases/deliverables; Acquittals and the like.

T5. Quality management - Quality management concepts; Standard practices for managing quality within a project.

T6. Human Resource management - human resource management concepts; standard practices for managing personnel within a project

T7. Communication management - Communication management concepts; Standard practices for managing communication within a project and the like.

T8. Risk management and contingencies - risk management concepts; standard practices for managing risk within a project; Internal risks; External risks; Risk minimisation; Risk removal; Contingencies and the like.

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REQUIRED SKILLS AND KNOWLEDGE

T9. Procurement management - procurement management concepts; standard practices for managing procurement and the like.

T10. Physical Resource management - Types of physical resource, including; Equipment, Technology, Information, Facilities; Physical resource management concepts; Standard practices for managing physical resources

T11. Contracts - Understanding project contracts; Standard practices for working to contract specifications; Contract format; Contract content; Legal obligations of contract parties; Accompanying documentation including; Contract Schedules and the like.

T12. Performance assessment and continuous improvement - standard performance assessment practices; standard continuous improvement practices and the like

T13. Engineering ethics principles

T14. Customer/Client relations

- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work

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environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control

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measures as specified in the performance criteria and range statement
    - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
    - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
    - Demonstrate an appropriate level of skills enabling employment
    - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
  - Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
    - Manage electronics/computer systems projects as described in 8) and including:

A	Establishing the scope of the project accurately.
B	Managing time effectively.
C	Developing project plans.
D	Managing resources and variations effectively.
E	Resolving conflicts.
F	Adopting risk management strategies.
G	Maintaining records and submitting progress reports.
H	Verifying the project technical design, modification, installation, and/or maintenance of system and equipment parameters
I	Meeting project outcomes.
J	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to managing electronic/computer systems projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to managing medium sized electronics/computer systems projects (see Note 1), which involves design, modifications, installation, and/or maintenance of systems and equipment, with attributes that include management of safety, budget variation, personnel, resources and critical path timelines, and completion documentation.

Note 1:

Medium sized electronics/computer systems projects are those which would be recognised by a representative peer group of industry experts as medium sized within the norm customs and practices of the industry.

Note 2:

“Work breakdown structure” (WBS) – used for the purposes of identifying manageable components of a project including their hierarchical structure.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electronics/Computer Systems

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UEENEEH142A Solve oscillator problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers determining correct operation of discrete component and modularised oscillators. It encompasses working safely, problem solving procedures, including the use of; voltage, current, resistance and phase measuring devices, providing solutions derived from measurements and calculations to predictable problems in oscillators.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended for development of competency in either entry-level employment based programs incorporated in approved contracts of training or other approved training programs. It may also be used to augment formally acquired competencies.

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at

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License to practice **3)**

voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH114B	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH139A	Troubleshoot basic amplifier circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in

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this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on oscillator sections.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of oscillator problems is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to

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ELEMENT	PERFORMANCE CRITERIA	
		ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve oscillator section problems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solve problems from measure and calculated values as they apply to oscillator sections in an electronic apparatus.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in

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ELEMENT	PERFORMANCE CRITERIA
	accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in oscillator sections of electronic apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH142A Oscillator problem solving

Evidence shall show an understanding of oscillator problem solving, applying safe working practices and relevant Standards Codes and Regulations to an extent indicated by the following aspects:

T1. Requirements for Oscillation

- Feedback principles
- Barkhausen Criterion
- Frequency Stability
- Effects of Load Impedance
- Causes of waveform distortion

T2. Problem Solving in Oscillator Circuits

- Practice in constructed circuits
- Practice with circuit simulators

T3. Wien Bridge Oscillators.

- Typical circuits and applications including operational amplifiers.
- Typical values for Av and β
- Derivation of the Lead Lag network

T4. Phase Shift Oscillators.

- Typical circuits and applications including operational amplifiers.
- Typical values for Av and β
- Derivation of three section phase shifts

T5. Colpitts Oscillators and Hartley Oscillators.

- Typical circuits and applications.
- Values for Av and β
- Circuits using collector and emitter sourced feedback

T6. Crystal Oscillators.

- Typical circuits and applications.
- Values for Av and β
- Circuits using collector and emitter sourced feedback

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REQUIRED SKILLS AND KNOWLEDGE

- Crystal Equivalent Circuit
- Parallel and series mode
- Fundamental and overtone operation

T7. Astable Oscillators

- Circuits using operational amplifiers
- Circuits using discrete components

T8. 555 timer I.C. ccts and applications

- Astable Oscillators
- Frequency Modulation
- Monostable Oscillators

T9. V.C.O. Circuits.

- Typical ccts. and applications
- The use of varactor diodes

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and

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regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as

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specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve oscillator problems as described in 8) Range: and including:

A	Using methodical problem solving methods.
B	Taking measurements correctly and accurately.
C	Calculating parameters correctly and accurately.
D	Providing solution to oscillator component/circuit problems.
E	Providing written justification for the solutions to problems.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

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These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to troubleshooting oscillators.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with unit.

UEENEEH102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH139A	Troubleshoot basic amplifier circuits

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by solving at least three problems in typical oscillator sections of electronic apparatus

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH145A Develop engineering solutions to analogue electronic problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers developing engineering solutions to solve problems with analogue electronics. It encompasses working safely, apply extensive knowledge of analogue electronics circuit and device operation and their application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical analogue electronic problems are those encountered in meeting performance requirements and compliance standards, revising analogue electronics operating parameters and dealing with analogue electronic malfunctions.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a

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License to practice **3)**

licence to practice in the workplace for work plant and equipment which is directly connected to installation wiring that operates at voltages above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH139A Troubleshoot basic amplifier circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in

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Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop engineering solution for analogue electronic problems.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the analogue electronic problem is determined from performance specifications and situation reports and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in

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ELEMENT	PERFORMANCE CRITERIA	
		the work.
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2 Develop engineering solution for analogue electronic problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of analogue electronics circuit, device operation, characteristics and applications are applied to developing solutions to analogue electronic problems.
	2.3	Parameters, specifications and performance requirements in relation to each analogue electronic problem are obtained in accordance with established procedures.
	2.4	Approaches to resolving analogue electronic problems are analysed to provide most effective solutions.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3 Test, document and implement engineering solution for analogue electronic problems.	3.1	Solutions to analogue electronic problems are tested to determine their effectiveness and modified where necessary.
	3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.
	3.3	Appropriately competent and qualified person(s) required to implement solutions to analogue electronic problems are coordinated in accordance with regulatory requirements and enterprise policy. (See Note)

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Justification for solutions used to solve analogue electronic problems is documented for inclusion in work/project development records in accordance with professional standards.

Note:

A licence to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing solutions to analogue electronic problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH145A Analogue electronic circuits and systems

Evidence shall show an understanding of analogue electronic circuits, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Single-stage analogue electronics

T1. Understanding of differential amplifiers using discrete components (transistors) of suitable characteristics to meet system objective

- differential gain, common mode rejection ratio and the required CMRR
- variable gain input stage

T2. Operational amplifier circuits

- use of d.c. offset
- operation of single-supply inverting and non-inverting amplifiers employing DC offset bias at the input and blocking capacitors
- operation of a high input resistance unity gain
- areas of use for single-supply amplifiers.

T3. Comparator circuits (open loop, limited swing and hysteresis) using operational amplifiers:

- ideal op-amp comparator
- typical uses of the comparator.
- comparators with limited (i) negative swing and (ii) both positive negative swing
- hysteresis comparator with positive resistor divider feedback and calculate the input switching voltages.
- desirable properties of an operational amplifier for use as comparator and the characteristics of comparator op amps.

T4. Amplifiers with given piecewise linear transfer characteristics

T5. Operation and building precision of half-wave and fullwave rectifiers

- precision two-diode half-wave and full-wave rectifier
- typical applications of precision rectifiers.

T6. Oscillators

- Operation of oscillators

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REQUIRED SKILLS AND KNOWLEDGE

- Purpose of oscillators
- Conditions for sustained oscillation
- Operation of phase shift oscillators
- The operation and characteristics of a Colpitts oscillator
- Conditions that cause instability in amplifier circuits

Advanced power amplifiers

- Analysing the performance of power amplifiers
- Minimum power, voltage and current rating of an output transistor.
- Aspects of heat transfer related to heat sinking.
- Common forms of distortion encountered in power amplifiers. (eg. Total harmonic distortion)
- Techniques for overcoming common forms of distortion.

T9. (is the number correct?)Classes of power amplifiers and indicate typical maximum efficiencies for each class

- conduction, angle, output power and efficiency of a power amp.
- typical and/or maximum efficiencies of each class of power Amp.
- d.c and/or a.c load line,
- output power and efficiency of a large signal amplifier

T10. Operation of each class and type of power amplifier circuit

- load line operation.
- Class A – direct, RC, transformer coupled. Class B – Complementary symmetry, drivers, single supply/duel supply. Class C and Class D.
- measure the characteristics of a fully integrated operational power Amplifiers.

T11. Active filters

- frequency response of low-pass, high-pass, low-Q band-pass, high-Q bandpass, notch and all-pass filters and define pass-band, stop-band and rate of roll-off.
- main features in the amplitude and phase plots of Butterworth, Chebyshev, Cauer-Elliptic and Bessel filter responses.
- pros and cons of active and passive filters.
- non-unity gain Sallen-Key low-pass filter.
- Types of active filters available in IC form - Variable filter, Switched Capacitor Filters and digital (sampled data) filters.
- Low-Q (i.e. cascade of lowpass and high-pass) and/or narrow bandpass filters

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop solutions to analogue electronic problems as described in 8) and including:

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A	Understanding the extent of the analogue electronic problem.
B	Forming effective strategies for solution development and implementation.
C	Obtaining analogue electronic parameters, specifications and performance requirements appropriate to each problem.
D	Testing and solutions to analogue electronic problems.
E	Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.
F	Documenting justification of solutions implemented in accordance with professional standards.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

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The resources used for assessment should reflect current industry practices in relation to developing solutions to analogue electronic problems.

Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to developing engineering solution for at least four analogue electronic problems.

Note.

Typical analogue electronic problems are those encountered in meeting performance requirements and compliance standards, revising an analogue electronic operating parameters and dealing with analogue electronic malfunctions.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH146A Solve fundamental electronic communications system problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers ascertaining correct operation of communications systems and solving fundamental system problems as met in engineering support work functions. It encompasses working safely; problem solving techniques, and the use of a range of measuring devices, providing solutions derived from measurements to predictable problems in electronic communication systems.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 3 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to solve fundamental problems in electronic communications systems.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve fundamental problems in electronic communications systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Knowledge of fundamental characteristics communication system components and transmission media is applied to solving system problems.
	2.5	Logical approaches are used to solve system problems from measure and calculated values as they apply to communication systems.
	2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.7	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Reports are written outlining system problem and justifying solutions used.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving fundamental problems in electronic communications systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH146A Fundamental electronic communications systems

Evidence shall show an understanding of fundamental electronic communications systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Requirements of a Radio Communications System

- Safety
- Communications system requirements
- Notion of decibels including dB, dBm, dBmV, dBuV
- Antenna Types
- Modulation
- Baseband signals
- Bandwidth
- Wavelength and frequency
- Radio spectrum

T2. Optical Communications Principles

- Safety
- Optical fibre fundamentals
- Optical fibre parameters
- Typical optical link
- Bit rates

T3. Wave Propagation

- Half wave dipole
- Radiation patterns
- Polarisation
- Propagation modes

T4. Modulation Concepts and Amplitude Modulation (AM)

- Modulation principles
- Sidebands
- Types of modulation (Analog and digital modulation)

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REQUIRED SKILLS AND KNOWLEDGE

- Circuit verification of the modulation process
- AM envelope
- Diodes as modulators/demodulators
- Modulation index, Percentage, Spectral content, Over modulation
- Calculating sideband frequency and power of AM signals
- Bandwidth requirements for radio services
- Bandwidth measurement
- The diode demodulator circuit.

T5. Introduction to Frequency and Phase Modulation

- Typical deviations
- Carson's rule
- Sideband distribution
- Carrier and sideband power
- Phase modulation
- Pre-emphasis/ De-emphasis
- Limiter stage
- FM detectors

T6. The superheterodyne Receiver

- The TRF receiver
- AM superheterodyne receiver block diagram
- RF and IF amplifier
- Image and intermediate frequencies
- FM superheterodyne receiver
- Sensitivity, selectivity and image rejection
- Measurements of receiver parameters
- Binary Digital Modulation/Demodulation

T7. Supplementary Receiver circuitry

- AFC and AGC systems

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve fundamental problems in electronic communications systems as described in 8) and including:

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A	Applying knowledge of communication system and transmission media characteristics.
B	Using logical and methodical approaches to solving system problems.
C	Solving system problems.
D	Providing written justification for solutions used.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving fundamental problems in electronic communications systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

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Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by reporting on fundamental issues related to an electronic communications system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH147A Assess electronic apparatus compliance

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers assessing electronic apparatus for compliance with a standard and/or regulation for the purpose of certification or approval. The unit encompasses safe working practices, determining specified requirements, inspecting, setting up performance tests, evaluating inspection and test results and documenting evaluation outcomes.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to evaluate electronic apparatus compliance.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Examination and testing area is checked for safety hazards and risk control measures implemented in strict accordance with safety policy and procedures.
	1.4	Relevant documentation is obtained and read to determine the certification/approval specifications for which the equipment is to be assessed. (see note 1)
	1.5	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2 Evaluate electronic apparatus compliance	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	In depth knowledge of the operating requirements of the electronic apparatus under scrutiny is applied to the assessment process.
	2.5	Apparatus examination and tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
	2.6	Apparatus examination and tests are carried out methodically and results and comments systematically noted.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Assessment is carried out without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document evaluate results.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Examination and test results are evaluated and non-compliance issues identified.

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Examination, test results and comments on non-compliance issues are documented and reported to appropriate person(s) in accordance with established procedures.

Note 1

Examples of documentation are those specifying safety requirements, technical standard, as marketed technical performance, product quality endorsement standards and the like.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assessing compliance of electronic apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH147A Electronic apparatus compliance assessment

Evidence shall show an understanding of electronic apparatus compliance assessment, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Technical standards, regulations and codes for electronic apparatus

- Standards philosophy and format
- How to read and apply a standard
- Standards and Codes that apply to electronic apparatus
- Applying standards, regulations and codes

T2. Compliance certification

- the purposes of certification of equipment;
- the parties involved in the assessment/testing and certification of equipment, and
- the scheme for recognition of assessment/testing and certification

T3. Preparation required to assess equipment for compliance with Standards:

- documentation required prior to conducting conformity assessment;
- tests necessary to establish that an item of equipment conforms with relevant Standards;

T4. Compliance testing and assessment of equipment

- types of assessment tests
- test set ups and procedures.
- recording and reporting requirements of conformity assessment.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assess compliance of electronic apparatus as described in 8) and including:

A	Interpreting compliance documents.
B	Setting up and conducting appropriate examinations and tests.
C	Identifying non-compliance defects.
D	Reporting examination and test results and non-compliance iss

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	clearly and accurately.
E	Dealing with unplanned events by drawing on essential knowle and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assessing compliance of electronic apparatus.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG13 1A Assess electrical apparatus compliance

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by assessing a representative range of four different electronic apparatus.

Note:

Examples of apparatus are audio amplifiers, radio and televisions receivers, video displays, audio and video recording/replay devices, two-way radios, cell phones, instrumentation devices, control devices and the like.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH148A Design and develop advanced digital systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design and development of advanced digital systems. It encompasses working safely, following design brief, applying knowledge of digital components/devices, interpreting device/component specifications, constructing prototype devices, applying programming techniques to programmable devices, testing developed system prototype operation, verifying compliance of the design against the final brief, and documenting design and development work.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design and develop advanced digital systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the proposed digital system development is determined from the design brief or in consultations with appropriate person(s).
	1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
	1.5	Materials and devices/components required for the work are selected on compatibility of their specifications with digital system requirements and project budget constraints.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Design and develop advanced digital systems.	2.1	OHS risk control work measures and procedures are followed.
	2.2	Knowledge of digital devices and systems and compliance standards are applied to the design
	2.3	Alternative arrangements for the design are considered based on the requirements outlined in the design brief.
	2.4	Safety, functional and budget considerations are

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ELEMENT	PERFORMANCE CRITERIA	
		incorporated in the design.
	2.5	Prototype devices and circuits are constructed and tested for compliance with the design brief and regulatory requirements.
	2.6	Prototype malfunctions are rectified and retested to ensure effective operation of design.
	2.7	Digital system design is documented for submission to appropriate person(s) for approval.
	2.8	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for the design.	3.1	The design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for modifications to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing and developing advanced digital systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH148A Advanced digital systems design and development

Evidence shall show an understanding of advanced digital systems design and development, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Design techniques for combinational and sequential logic circuits (as a minimum a three levels, four input circuit).

- equation writing, reduction
- propagation delay calculation

T2. Design of complex sequential logic circuits (as a minimum a three levels sequential circuit) using current techniques - equation writing, reduction, propagation delay calculation, etc.

T3. Selection of current types of oscillators based on their characteristics and operation.

T4. Selection of current memory and storage devices based on their characteristics and operation - (eg flash, I2C)

T5. Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- circuit arrangement using test/measuring devices(eg multimeters, voltage and digital testers, signal generators and oscilloscopes)
- Taking readings
- Storage, maintenance and care of test/measuring devices

T6. Electronic Safe working practices

- Application of risk management principles
- Control measures for dealing with
  - non-electrical hazards
  - extra-low voltage hazards
  - low-voltage hazards
  - high-voltage hazards
  - high-current hazards

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REQUIRED SKILLS AND KNOWLEDGE

T7. Digital to analogue conversion

- Applications of D/A converters
  - Summing D/A converters
  - R-2R D/A converters
  - Verification of circuit operation of an IC D/A converter
  - Selection of an D to A for use in a digital application based on their characteristics and operation.

T8. Analogue to digital conversion

- Applications of A/D converters
- Digital ramp, dual slope, successive approximation and simultaneous (flash) A/D converters.
- Verification of circuit operation of an IC A/D converter
- Selection of an A to D for use in a digital application based on their characteristics and operation.

T9. Programmable logic devices

- Types of programmable logic devices
- Comparison between different programmable logic devices
- Programmable Logic Devices (PLD) and CPLDs
- Field Programmable Gate Arrays (FPGA)
- Programming and verifying correct operation

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best

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utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline,

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work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and develop advanced digital systems as described in 8) and including:

A	Developing outlines of alternative designs.
B	Developing the design within the safety and functional requirements and budget limitations.
C	Constructing and testing prototype devices and circuits according to design brief and regulatory requirements.
D	Documenting and presenting design effectively.
E	Successfully negotiating design alteration requests.
F	Obtaining approval for final design.
G	Verifying compliance of the design against the final brief.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing and developing advanced digital systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing and developing an advanced digital system with at least five variables and a mixture of sequential and combinatorial functions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH149A Develop engineering solutions to audio electronic problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers developing engineering solutions to resolve problems with audio electronics. It encompasses working safely, applying extensive knowledge of audio electronics circuits and device operation and application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives

Note.

Typical audio electronic problems are those encountered in meeting performance requirements and compliance standards, revising audio electronic operating parameters and dealing with audio electronic malfunctions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace for work involving

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License to practice **3)**

direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH139A Troubleshoot basic amplifier circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 5 Writing 5 Numeracy 5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop engineering solution for audio electronic problems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the audio electronic problem is determined from performance specifications and situation reports and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled

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ELEMENT		PERFORMANCE CRITERIA	
			timelines in consultation with others involved in the work.
		1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2	Develop engineering solution for audio electronic problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of audio electronics circuit, device/component operation, characteristics and applications are applied to developing solutions to audio electronic problems.
		2.3	Parameters, specifications and performance requirements in relation to each audio electronic problem are obtained in accordance with established procedures.
		2.4	Approaches to resolving audio electronic problems are analysed to provide most effective solutions.
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
		2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3	Test, document and implement engineering solution for audio electronic problems.	3.1	Solutions to audio electronic problems are tested to determine their effectiveness and modified where necessary.
		3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.
		3.3	Appropriately competent and qualified person(s) required to implement solutions to audio electronic problems are coordinated in accordance with regulatory requirements and

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ELEMENT	PERFORMANCE CRITERIA
	enterprise policy. (See Note)
	3.4 Justification for solutions used to solve audio electronic problems is documented for inclusion in work/project development records in accordance with professional standards.

Note:
A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing solutions to audio electronic problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH149A Audio electronics engineering solutions

Evidence shall show an understanding of audio electronics engineering solutions, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Acoustics, spatial treatment and sound reproduction

- Effects of room dimensions, spatial shape and surface textures on acoustics
- Ideal acoustic for specific purposes - speech, solo or small group music, rock music orchestral music, choral music, cinema and the like.
- Measuring room response
- Speaker placement and room response
- Room treatment methods to improve acoustic response
- Active methods to improve acoustic response

T2. Audio reproduction, electronic components

- Preamplifiers amplifier encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Power and integrated amplifiers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Graphic equalizers encompassing:
  - Function in the reproduction chain
  - Typical circuit arrangements
- Component interconnections

T3. Advanced electronic testing and measuring devices and techniques

- Test/measuring devices and their application - frequency counters, and synthesisers, spectrum analysers, noise and distortion meters and RF communications service monitor.
- Connection of test/measuring devices into a circuit encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- safety procedures
- loading and matching
- storage and delay
- circuit arrangement of test/measuring devices
- Taking and interpreting readings
- Notion of decibels including dBm, dBr, dBu, dBo

T4. Audio system advance diagnostic techniques

- Perception and measurement of sound
- Acoustics and equalisation
- Sound recording and reproduction technologies

Audio component testing, measurements and adjustments - frequency response for given loads, small signal test, distortion measurement, noise measurement, frequency versus distortion, intermodulation spectrum, spectral-decay plots, acoustic cross-over, anechoic response, lateral and vertical response and the like.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside

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the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop solutions to audio electronic problems as described in 8) and including:

A	Understanding the extent of the audio electronic problem.
B	Forming effective strategies for solution development and implementation.
C	Obtaining audio electronic parameters, specifications and performance requirements appropriate to each problem.
D	Testing and solutions to audio electronic problems.
E	Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.
F	Documenting justification of solutions implemented in accordance with professional standards.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment **9.3)**

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This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing solutions to audio electronic problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing engineering solutions for at least four representative range audio electronic problems.

Note.

Typical audio electronic problems are those encountered in meeting performance requirements and compliance standards, revising an audio electronic operating parameters and dealing with audio electronic malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH150A Assemble and set up basic security systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers installing electronic security systems with up to 50 connected devices typically used in single domestic and small commercial premises. It encompasses, working safely and to standards, following oral and written instructions and procedures, securely placing and connecting security system components, and applying customer relation protocols.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training or approved training programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice of this unit in the work place is subject to State and Territory Security Industry regulations. Where the

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License to practice **3)**

security system has a call-back-to-base facility practice in the workplace is also subject to ACMA regulations to undertake cabling work.

Note:

Units ‘UEENEEF101A and UEENEEF102A provide the required skill and knowledge for registration in accordance with ACMA regulations for undertaking cabling work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assemble and set up basic wired and wireless security systems.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines.
	1.2	Established OHS risk control measures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.
	1.4	The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be

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ELEMENT	PERFORMANCE CRITERIA	
		undertaken.
	1.5	Advice is sought from the work supervisor or other appropriate person to ensure the work is co-ordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established routines.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Assemble basic wired and wireless security systems.	2.1	Established OHS risk control measures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Security controllers, access, intrusion and surveillance devices are located for optimum performance within limitation imposed by customers and regulations.
	2.4	Accessories are installed straight and square in the required locations and within acceptable tolerances.
	2.5	Cables and conductors are terminated at accessories in accordance with manufacture's specifications and regulatory requirements.
	2.6	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.7	Security installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and document security systems installation.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Security system is documented in accordance with regulatory requirement and established routines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assembling and setting up basic wired and wireless security systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH150A Basic security system assembly and set up

Evidence shall show an understanding of basic security system assembly and set up, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Regulations applicable to the security industry

- Security Act
- Occupational Health and Safety Act
- Australian Standards AS630, AS2201
- ACMA Standards

T2. Circuit arrangements

- Range of typical resistor values used in alarm systems
- End line resistors
- Wiring of a detector with split EOL resistors
- Zone doubling
- Open circuits and short circuits

T3. Mechanical detectors

- Pressure pads
- Trip wires
- Window tape
- Screens
- Switches
- Vibration

T4. Electro-mechanical detectors

- Ultrasonic
- Microwave
- Glass break
- Smoke
- Active infrared beams
- Passive infrared
- Strain system

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REQUIRED SKILLS AND KNOWLEDGE

- Renamed magnetic reed switches
- Optical fibre cable

T5. Relays

- NC and NO relays
- transistor as a switch
- wiring diagram for a relay connected to an open collector output on an alarm panel
- typical uses for a relay type output

T6. Security panels

- Features of commonly used panels
- Operation of programmable and non-programmable panels
- Sound sources used with security alarms
- Power sources used with security systems
- Panel to base communication systems
- Locks commonly used in the security industry
- Batteries:
  - types
  - application
  - maintenance

T7. Communication systems

- Panel to base systems
- Dialler sequence
- Secsoa dialling system
- Dual tone multi frequency
- Ademco high speed
- Ademco contact ID

T8. Closed circuit television

- Application
- Types of cameras
- Types of monitors
- Switching methods
- Earthing
- Ambient lighting

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble and set up basic wired and wireless security systems as described in 8) and including:

A	Reading and interpreting drawings related to cable layouts and apparatus locations.
B	Placing and securing devices and accessories accurately.
C	Maintaining fire integrity.

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D	Terminating cable and conductors correctly.
E	Documenting installation.
F	Dealing with unplanned events by drawing on essential knowle and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcome vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling and setting up basic wired and wireless security systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

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Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

The critical aspects of occupational health and safety covered in UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by installing for a representative range of basic wired and wireless security systems at least two basic security system.

Systems shall consist of a controller and access device and at least two other different connected device both wire and wireless.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH151A Install large security systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers installing, entering instructions and testing of electronic security systems within excess of 50 connected devices in buildings, premises and precincts. It encompasses working safely and to standards, following and job specifications, securely placing and connecting security system components, and applying customer relation protocols.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training or approved training programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice of this unit in the work place is subject to State and Territory Security Industry regulations. Where the

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License to practice **3)**

security system has a call-back-to-base facility practice in the workplace is also subject to ACMA regulations to undertake cabling work.

Note:

Unit ‘UEENEEF102A and UEENEEF104A provide the required skill and knowledge for registration in accordance with ACMA regulations for undertaking cabling work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH150A	Assemble and set up basic security systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 3 Writing 3 Numeracy 3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and set up basic wired and wireless security systems.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines.
	1.2	Established OHS risk control measures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.
	1.4	The nature and location of the work is obtained from work supervisor or other appropriate

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ELEMENT		PERFORMANCE CRITERIA	
			person to establish the scope of work to be undertaken.
		1.5	Advice is sought from the work supervisor or other appropriate person to ensure the work is co-ordinated effectively with others.
		1.6	Sources of materials that may be required for the work are established in accordance with established routines.
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Install basic wired and wireless security systems.	2.1	Established OHS risk control measures for carrying out the work are followed.
		2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.3	Security controllers and devices are located for optimum performance within limitation imposed by customers and regulations. (See note 1)
		2.4	Accessories are installed straight and square in the required locations and within acceptable tolerances.
		2.5	Cables and conductors are terminated at accessories in accordance with manufacture's specifications and regulatory requirements.
		2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.8	Security installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA
3 Set up basic wired and wireless security systems and document.	3.1 OHS work completion risk control measures and procedures are followed. 3.2 Work site is cleaned and made safe in accordance with established procedures. 3.3 Security system is documented in accordance with regulatory requirement and established routines. Note1: Examples of security devices are, Reed switches, PIRs, Glass break facilities, Panic buttons, Monitored Door Strikes, Momentary Key Switches, Latching Key Switches, CCTVs, Monitors and Access panels.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing large wired and wireless security systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH151A Large security systems

Evidence shall show an understanding of closed circuit televisions to an extent indicated by the following aspects:

T1 Application CCTV systems encompassing:

- Sub-system components (i.e. functional blocks) and their function

T2 Television principles encompassing:

- Sub-system components (i.e. functional blocks) and their function
- Video signals

T3 CCTV cameras encompassing:

- Types of cameras
- Sub-system components (i.e. functional blocks) and their operating parameters

T4 Camera lens encompassing:

- Types of lenses and their characteristics
- Application of various types
- Setting up

T5 Monitors and recording devices

- Types and application
- Analogue and digital recording devices and their application

T6 Installation and mounting encompassing:

- Consideration in locating and mounting CCTV camera and auxiliary equipment

  Note.

  1. Examples are need for sealed and heated housings, IP rating required, methods for overcoming earth (ground) loops, need for lighting protection.

  2. Examples of auxiliary equipment are in-line video amplifiers/ equalizers and video distribution amplifiers

T7 Evidence shall show an understanding of advanced electronic security systems to an extent indicated by the following aspects:

- Connection of input and output devices to detectors and control panels
- Procedures to perform hardware and software upgrades

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REQUIRED SKILLS AND KNOWLEDGE

- Types of code pads and commands required to operate the system

T8 Security video monitoring and recording

Evidence shall show an understanding of security video monitoring and recording to an extent indicated by the following aspects:

- Principles of television systems
- Multiplexing techniques
- Multiplex display and recording of CCTV
- Digital encoding techniques
- Video distribution and transmission techniques
- Microprocessor based CCTV systems
- Factors affecting picture quality

T9 Evidence shall show an understanding of biometric devices to an extent indicated by the following aspects:

- Biometrics techniques and processes including definitions, terminology, advantages, disadvantages and applications

  Note.

  Includes basic principles of database design, software techniques, classifier combination, feature extraction, feature enhancement, chain code methods, image analysis, biometric transforms, matching techniques, verification and identification, biometric tools, satistical measures of biometrics

T10 Biometric device tools, software and testing techniques

- Physical interaction with biometric devices including operation and installation of biometric devices examples are iris scanners, hand scanners voice recognition apparatus, facial recognition devices and like equipment
- Legal aspects of biometrics
- Australian laws impacting on biometrics security and privacy legislation.
- Australian standards

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install large wired and wireless security systems as described in 8) and including:

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A	Reading and interpreting drawings related to cable layouts and apparatus locations.
B	Placing and securing devices and accessories accurately.
C	Maintaining fire integrity.
D	Terminating cable and conductors correctly.
E	Documenting installation.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing large wired and wireless security systems.

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Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE 108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits
UEENEEF102A	Install and maintain cabling for multiple access to telecommunication services
UEENEEH 150A	Assemble and set up basic security systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by installing for a representative range of large wired and wireless security systems at least two large security systems.

Systems shall have controllers and more than 50 connected devices of five different types.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH152A Enter instructions and test wired and wireless security systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers, entering instructions and testing electronic security systems with up to 50 connected devices typically used in single domestic and small commercial premises. It encompasses safe working practices, basic programming as directed in user manuals, adjusting security devices, system testing and following written and oral instruction and procedures and customer relations.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training or approved training programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to

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License to practice **3)**

electrical work.

Practice of this unit in the work place is subject to State and Territory Security Industry regulations. Where the security system has a call-back-to-base facility practice in the workplace is also subject to ACMA regulations to undertake cabling work.

Note:

Units ‘UEENEEF102A and UEENEEF104A provide the required skill and knowledge for registration in accordance with ACMA regulations for undertaking cabling work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH150A	Assemble and set up basic security systems

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to enter instructions and test security systems.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines.
		1.2	Established OHS risk control measures are

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ELEMENT	PERFORMANCE CRITERIA	
		followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.
	1.4	The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor or other appropriate person to ensure the work is co-ordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established routines.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Enter instructions and test wired and wireless security systems.	2.1	Established OHS risk control measures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Security devices are checked for correct location and alignment.
	2.4	Security functions are entered into the system in accordance with manufacturer’s instructions.
	2.5	Security system is tested in accordance with manufacturer’s instructions.
	2.6	Security system operational malfunctions are identified and corrected.
	2.7	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.8	Security program and testation is carried out

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ELEMENT	PERFORMANCE CRITERIA	
		efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3 Complete and document security systems set-up and testing.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Security system is documented in accordance with regulatory requirement and established routines.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and entering instructions, testing wired and wireless security systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH152A Security systems software functions and configurations

Evidence shall show an understanding of security systems basic software to an extent indicated by the following aspects:

- Security system software functions and configuration options
- Access and detection functions
- Diagnostic functions and their use

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Enter instructions and test wired and wireless security systems as described in 8) and including:

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A	Entering system instructions.
B	Testing system functions.
C	Identifying and correcting operational malfunctions.
D	Documenting 'as-installed' system correctly.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to entering instructions, testing basic wired and wireless security systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH150A Assemble and set up basic security systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by enter instructions and testing of a representative range of wired and wireless security systems at least two basic security systems.

Systems shall consist of a controller and access device and at least two other different connected device both wire and wireless.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH153A Program and test large security systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers programming functions and testing electronic security systems with in excess of 50 connected devices in buildings, premises and precincts. It encompasses safe working practices, programming, adjusting security devices, system testing and following written and oral instruction and procedures and customer relations.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training or approved training programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice of this unit in the work place is subject to State and Territory Security Industry regulations. Where the

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License to practice **3)**

security system has a call-back-to-base facility practice in the workplace is also subject to ACMA regulations to undertake cabling work.

Note:

Units ‘UEENEEF102A and UEENEEF104A provide the required skill and knowledge for registration in accordance with ACMA regulations for undertaking cabling work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH150A	Assemble and set up basic security systems
UEENEEH154A	Program and commission commercial security systems
UEENEEH1	Program and commission commercial

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Prerequisite Unit(s) **4)**

55A	access control security systems
UEENEEH156A	Program and commission commercial security closed circuit television systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to program and test large security systems.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines.
	1.2	Established OHS risk control measures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.
	1.4	The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor or other appropriate person to ensure the work is co-ordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established routines.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Program and test large wired and wireless security systems.	2.1	Established OHS risk control measures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Security devices are checked for correct location and alignment.
	2.4	Security function codes are entered into the system in accordance with manufacturer’s instructions.
	2.5	Security system is tested in accordance with manufacturer’s instructions.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Security system operational defects are identified and corrected.
	2.7	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.8	Security program and testation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3 Complete and document security systems programming and testing.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Security system is documented in accordance with regulatory requirement and established routines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and programming, testing large wired and wireless security systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH153A **Security systems programming methods**

Evidence shall show an understanding of security systems programming methods to an extent indicated by the following aspects:

T1 Vender programming codes and functions encompassing:

- Input/output instruction
- Variable
- Timers
- Limitations of vender software

T2 Program loading methods using a personal computer

T3 Program testing methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Program and test large wired and wireless security systems as described in 8) and including:

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A	Entering system instructions.
B	Testing system functions.
C	Identifying and correcting operational malfunctions.
D	Documenting ‘as-installed’ system correctly.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to programming, testing large wired and wireless security systems.

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Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH 154A	Program and commission commercial security systems
UEENEEH 155A	Program and commission commercial access control security systems
UEENEEH 156A	Program and commission commercial security closed circuit television systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by program and testing of a representative range of large wired and wireless security systems at least two large security system.

Systems shall have controllers and more than 50 connected devices of five different types.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH154A Program and commission commercial security systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation and testing of security alarm system typically used in commercial buildings and premises The unit encompasses working safely, following specifications and security access scenarios, programming security alarm functions, using circuit diagrams and schedules, and providing as-programmed document.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of

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License to practice **3)**

training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH150A	Assemble and set up basic security systems
UEENEEH152A	Enter instructions and test wired and wireless security systems

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Prerequisite Unit(s) **4)**

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to program and commission.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of programming and commissioning is determined from reports and other documentation and fro discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to program and commission are obtained in accordance with established procedures and checked for correct operation and safety.
2 Program and commission.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Security alarm functions and instructions are entered into the system in accordance with design specifications.
	2.5	Security alarm devices are checked for correct location and alignment.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Security alarms are tested in accordance with commissioning requirements.
	2.7	Sources of alarm anomalies are identified and corrected.
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.10	Programming and commissioning activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report programming and commissioning activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	‘As-installed’ security alarm system is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and programming and commissioning commercial security alarm systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH154A **Security systems alarms programming**

Evidence shall show an understanding of security systems alarms programming to an extent indicated by the following aspects:

T1 Vender programming codes and functions encompassing:

- Input/output instruction
- Variable
- Timers
- Limitations of vender software

T1 Program loading methods using a personal computer

T2 Program testing methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Program and commission commercial security alarm systems as described in 8) and including:

A	Entering system functions.
B	Testing system functions.
C	Identifying and correcting function anomalies.
D	Documenting ‘as-installed’ system correctly.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment **9.3)**

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

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- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to programming and commissioning commercial security alarm systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

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UEENEEH 153A	Program and test large security systems
UEENEEH 155A	Program and commission commercial access control security systems
UEENEEH 156A	Program and commission commercial security closed circuit television systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of commercial security alarm systems by programming and commissioning at least two different commercial security alarm systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH155A Program and commission commercial access control security systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation and testing of security access control system typically uses in commercial buildings and premises The unit encompasses working safely, following specifications and security access scenarios, programming security functions, using circuit diagrams and schedules, and providing as-programmed document.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of

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License to practice **3)**

training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH150A	Assemble and set up basic security systems
UEENEEH152A	Enter instructions and test wired and wireless security systems

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Prerequisite Unit(s) **4)**

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to program and commission.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of programming and commissioning is determined from reports and other documentation and fro discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to program and commission are obtained in accordance with established procedures and checked for correct operation and safety.
2 Program and commission.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Security access control instructions and functions are entered into the system in accordance with design specifications.
	2.5	Security access control devices are checked for correct location and alignment.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Security access controls are tested in accordance with commissioning requirements.
	2.7	Sources of access control anomalies are identified and corrected.
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.10	Programming and commissioning activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report programming and commissioning activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	‘As-installed’ security access control system is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and programming and commissioning commercial security access control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH155A **Security systems access control programming**

Evidence shall show an understanding of security systems access control programming to an extent indicated by the following aspects:

T1 Vender programming codes and functions encompassing:

- Input/output instruction
- Variable
- Timers
- Limitations of vender software

T2 Program loading methods using a personal computer

T3 Program testing methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Program and commission commercial security access control systems as described in 8) and including:

A	Entering system functions.
B	Testing access control functions.
C	Identifying and correcting function anomalies.
D	Documenting ‘as-installed’ system correctly.
E	Dealing with unplanned events by drawing on essential knowle and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcome vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

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- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to programming and commissioning commercial security access control systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH153A	Program and test large security systems
UEENEEH154A	Program and commission commercial security systems
UEENEEH15	Program and commission commercial security

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6A closed circuit television systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of commercial security access control systems by programming and commissioning at least two different commercial security access control systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH156A Program and commission commercial security closed circuit television systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers installation and testing of security closed circuit television (CCTV) systems typically used in commercial buildings and premises The unit encompasses working safely, following specifications and security observation scenarios, programming security functions, using circuit diagrams and schedules, and providing as-programmed document.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH150A	Assemble and set up basic security systems
UEENEEH1	Enter instructions and test wired and

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Prerequisite Unit(s) **4)**

52A wireless security systems

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to program and commission CCTV systems	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of programming and commissioning is determined from reports and other documentation and fro discussion with appropriate personnel
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site
	1.6	Tools, equipment and testing devices needed to program and commission are obtained in accordance with established procedures and checked for correct operation and safety.
2 Program and commission CCTV systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Security closed circuit television functions are entered into the system in accordance with design specifications.
	2.5	Security closed circuit television devices are checked for correct location and alignment.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Security closed circuit televisions are tested in accordance with commissioning requirements.
	2.7	Sources of closed circuit television anomalies are identified and corrected.
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.10	Programming and commissioning activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report programming and commissioning activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	‘As-installed’ security closed circuit television system is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and programming and commissioning commercial security closed circuit television (CCTV) systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH156A Security systems closed circuit television programming

Evidence shall show an understanding of security systems access control programming to an extent indicated by the following aspects:

T1 Vender programming codes and functions encompassing:

- Input/output instruction
- Variable
- Timers
- Limitations of vender software

T2 Program loading methods using a personal computer

T3 Program testing methods

T4 Evidence shall show an understanding of OHS enterprise responsibilities to an extent indicated by the following aspects:

- Provisions of relevant health and safety legislation
- Principles and practice of effective occupational health and safety management
- Management arrangements relating to regulatory compliance
- Enterprise hazards and risks, control measures and relevant expertise required
- Characteristics and composition of workforce and their impact on occupational health and safety management
- Relevance of enterprise management systems to occupational health and safety management
- Analysis of working environment and design of appropriate occupational health and safety management systems
- Analysis of relevant data and evaluation of occupational health and safety system effectiveness
- Assess resources to establish and maintain occupational health and safety management systems.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Program and commission commercial security closed circuit television (CCTV) systems as described in 8) and including:

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A	Entering system functions.
B	Testing closed circuit television functions.
C	Identifying and correcting function anomalies.
D	Documenting ‘as-installed’ system correctly.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to programming and commissioning commercial security closed circuit television (CCTV) systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH 153A	Program and test large security systems
UEENEEH 154A	Program and commission commercial security systems
UEENEEH 155A	Program and commission commercial access control security systems

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of commercial security closed circuit television (CCTV) systems by programming and commissioning at least two different commercial security closed circuit television systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH157A Develop basic plans for integrating security systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers integrating security components to form a complete security system with up to 100 connected intrusion and access devices and based on common security scenarios. It encompasses applying knowledge of common security scenarios and security network standards and protocols, selecting network topology and physical media, disaster recovery planning, performance management and documentation of work activities.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH150A	Assemble and set up basic security systems
UEENEEH154A	Program and commission commercial security systems
UEENEEH155A	Program and commission commercial access control security systems
UEENEEH156A	Program and commission commercial security closed circuit television systems
UEENEEH153A	Program and test large security systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in

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this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop integrated security systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the proposed integrated security system is determined from the system specification or in consultations with appropriate person(s)

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ELEMENT	PERFORMANCE CRITERIA	
	1.4	Development work is planned to meet scheduled timelines in consultation with others involved on the work site
2 Develop integrated security system plan	2.1	Knowledge of common security scenarios and security network standards and protocols, network topology, physical media and disaster planning is applied to the system plan.
	2.2	Alternative system arrangements are considered based on the requirements job specification.
	2.3	Safety, functional and budget considerations are incorporated in the system plan.
	2.4	System draft plan is checked for compliance with the job specifications and regulatory requirements.
	2.5	System plan is documented for submission to appropriate person(s) for approval
	2.6	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
3 Obtain approval for system plan	3.1	System design is forwarded to client representative and/or other relevant person(s) for approval.
	3.2	Requests for alterations to the plan are negotiated with relevant person(s) in accordance with established procedures.
	3.3	Final system plan is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing basic integrated security systems plan.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH157A Common security scenarios and solutions

Evidence shall show an understanding of common security scenarios and solutions to an extent indicated by the following aspects:

T1. Alternative access arrangement

T2. Intrusion protection and monitoring options

T3. Available technologies

T4. Integration with other systems

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that,

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in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop basic integrated security systems plan as described in 8) and including:

A	Developing outlines of alternative system plan.
B	Developing the plan within the safety and functional requirements and budget limitations.
C	Documenting the plan effectively.
D	Obtaining approval for final plan.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials

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to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing basic integrated security systems plan.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of basic integrated security systems plan by planning two basic integrated security systems with up to 100 connected intrusion and access devices.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH158A Design integrated security systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers integrating security components to form a security system with multiple and interrelated subsystems. It encompasses applying knowledge of security scenarios and security network standards and protocols, selecting network topology and physical media, disaster recovery planning, performance management and negotiating with clients and others and documenting design.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus
UEENEEH157A	Develop basic plans for integrating security systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design integrated security systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the proposed integrated system is determined from the design brief or in consultations with appropriate person(s)
		1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site
2	Develop integrated security system design	2.1	Knowledge of security scenarios and security network standards and protocols, network topology, physical media and disaster planning is applied to the system design.
		2.2	Alternative arrangements for the system design are considered based on the requirements outlined in the design brief.
		2.3	Safety, functional and budget considerations are incorporated in the system design.
		2.4	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.5	System design is documented for submission to appropriate person(s) for approval
		2.6	Solutions to unplanned situation are provided

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ELEMENT	PERFORMANCE CRITERIA	
		consistent with organisation policy.
3 Obtain approval for system design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing integrated security systems for a single site.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH158A **Integrated security systems**

Evidence shall shoe an understanding of integrated security systems to an extent indicated by the following aspects:

T1. security scenarios

T2. security network standards and protocols

T3. network topology

T4. physical media

T5. disaster planning

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design integrated security systems for a single site as described in 8) and including:

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A	Developing outlines of alternative system plan.
B	Developing the design within the safety and functional requirements and budget limitations.
C	Documenting and presenting design effectively.
D	Successfully negotiating design alteration requests.
E	Obtaining approval for final design.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing integrated security systems for a single site.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of integrated security systems for a single site by designing two integrated security systems with multiple and interrelated subsystems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH159A Design integrated complex security systems for multiple sites

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers integrating security components to form a complex security system across multiple sites with multiple and related subsystems and remote monitoring and control. It encompasses applying knowledge of security scenarios and security network standards and protocols, selecting network topology and physical media, disaster recovery planning, performance management and negotiating with clients and others and documenting design.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus
UEENEEH158A	Design integrated security systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design integrated complex security systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the proposed integrated system is determined from the design brief or in consultations with appropriate person(s)
	1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site
2 Develop integrated complex security system design	2.1	Knowledge of complex security scenarios and security network standards and protocols, network topology, physical media and disaster planning and remote monitoring and control is applied to the system design.
	2.2	Alternative arrangements for the system design are considered based on the requirements outlined in the design brief.
	2.3	Safety, functional and budget considerations are incorporated in the system design.
	2.4	System design draft is checked for compliance with the design brief and regulatory requirements.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	System design is documented for submission to appropriate person(s) for approval
	2.6	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for system design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing integrated complex security systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH159A **Internetworking security systems**

Evidence shall show an understanding of internetworking security systems to an extent indicated by the following aspects:

T1. Security scenarios

T2. security network standards and protocols

T3. network topology

T4. physical media

T5. disaster planning

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work

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environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control

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measures as specified in the performance criteria and range statement
    - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
    - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
    - Demonstrate an appropriate level of skills enabling employment
    - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
  - Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
    - Design integrated complex security systems as described in 8) and including:

A	This unit shall be demonstrated by designing one integrated complex security system that extends across multiple sites with remote monitoring and control.
B	This unit shall be demonstrated by designing one integrated complex security system that extends across multiple sites with remote monitoring and control.
C	This unit shall be demonstrated by designing one integrated complex security system that extends across multiple sites with remote monitoring and control.
D	This unit shall be demonstrated by designing one integrated complex security system that extends across multiple sites with remote monitoring and control.
E	This unit shall be demonstrated by designing one integrated complex security system that extends across multiple sites with remote monitoring and control.
F	This unit shall be demonstrated by designing one integrated complex security system that extends across multiple sites with remote monitoring and control.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing integrated complex security systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of integrated complex security systems by designing one integrated complex security system that extends across multiple sites with remote monitoring and control.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH160A Plan large electronic projects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers development and documentation of large electronics project proposals, milestones and completions. The unit encompasses, establishing budgets, critical path analysis, development of workflow strategies, documenting, presenting and negotiating budgets and timelines.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 6 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to plan project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
		1.2	Established techniques for project planning are reviewed are adopted in accordance with organisation's policies.
		1.3	The extent of the project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
2	Develop project plan proposal.	2.1	Estimated plant, material, labour and other costs are sought and obtained from appropriate person(s) in accordance with organisation's policies and procedures.
		2.2	Project budget is established from estimated plant, material, labour and other costs in accordance with organisation's policies and procedures.
		2.3	Knowledge of critical path analysis is applied to developing workflow strategies.
		2.4	Sources and availability of materials and human resources needed for the project are established in accordance with organisation's policies and procedures.
		2.5	Risk management strategies are sought and obtained for incorporating in the project plan.
		2.6	Project plan is reviewed against all inputs and adjusted to rectify any anomalies.
		2.7	Project plan proposal is documented in accordance with organisation's policies and procedures.
3	Obtain approval for project plan.	3.1	Project plan is presented and discussed with person(s) of higher authority.
		3.2	Alterations to the project plan resulting from the presentation/discussion are negotiated with

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ELEMENT	PERFORMANCE CRITERIA	
		person(s) of higher authority within the constraints of organisation policy.
	3.3	Final project plan is documented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning electronic projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH160A Large Electronic Project Planning

Evidence shall show an understanding of project planning to an extent indicated by the following aspects:

2.2.16.1

T1. Purpose of project planning

T2. Documents needed to plan a project

T3. Factors influencing sequence and restraints of project activities

T4. Critical path analysis encompassing:

- Graphical representation methods
- Methods of representing time/rates

2.2.18

Evidence shall show an understanding of customer/client relations to an extent indicated by the following aspects:

T1. Purpose of critical path analysis

T2. Essential data

T3. Relational sequence of work activities

T4. Graphical representation methods

T5. Methods of representing time/rates

T6. Monitoring methods

2.2.29

Evidence shall show an understanding of electronic industry sector customs and practices to an extent indicated by the following aspects:

T1. Technical aspects of project planning and management encompassing:

- Method of ensuring equipment meets specified performance requirements
- Performance/cost benefit analysis
- Equipment procurement

T2. b) Typical approaches to planning and management

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REQUIRED SKILLS AND KNOWLEDGE

T3. c) Successful planning techniques

T4. d) Best practice management methods and styles

2.18.8.2

Evidence shall show an understanding of OHS enterprise responsibilities to an extent indicated by the following aspects:

T1. Provisions of relevant health and safety legislation

T2. Principles and practice of effective occupational health and safety management

T3. Management arrangements relating to regulatory compliance

T4. Enterprise hazards and risks, control measures and relevant expertise required

T5. Characteristics and composition of workforce and their impact on occupational health and safety management

T6. Relevance of enterprise management systems to occupational health and safety management

T7. Analysis of working environment and design of appropriate occupational health and safety management systems

T8. Analysis of relevant data and evaluation of occupational health and safety system effectiveness

a. T9 Assess resources to establish and maintain occupational health and safety management systems.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1)**
	Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best

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utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline,

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work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan electronic projects as described in 8) and including:

A	Determining the project requirements accurately.
B	Establishing a project budget.
C	Developing effective work flow strategies.
D	Documenting project plan proposal.
E	Negotiating alterations to the proposed project plan successfull
F	Obtaining approval of the final plan.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorpora in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to planning electronic projects.

The resources used for assessment should reflect current industry practices in relation to planning electronic projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative electronic project, by planning an industry accepted medium sized electronic project with the following attributes:

- budgets
- critical path analysis
- workflow strategies development
- budgets and timelines negotiation
- plan presentation
- documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH161A Install fire detection and warning system apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers installing electronic fire detection and warning systems in buildings and premises. It encompasses, working safely and to standards, following oral and written instructions and procedures, securely placing and connecting fire detection system and warning, components, and applying customer relation protocols.

Application of the Unit

Application of the Unit

2)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work. Where the fire alarm system has a call-back-to-base facility practice in the workplace is also subject to ACMA regulations to undertake cabling work.

Note:

Unit ‘UEENEEF102A’ provides the required skill and knowledge for registration in accordance with ACMA regulations for undertaking cabling work

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assemble and set up basic fire detection and warning systems.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines.
	1.2	Established OHS risk control measures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are reported and advise on risk control measures are sought from the work supervisor.
	1.4	The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor or other appropriate person to ensure the work is co-ordinated effectively with others.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Sources of materials that may be required for the work are established in accordance with established routines.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Assemble and set up basic fire detection and warning systems.	2.1	Established OHS risk control measures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Fire protection controller and detection and warning devices are located for optimum performance within limitation imposed by customers and regulations.
	2.4	Accessories are installed straight and square in the required locations and within acceptable tolerances.
	2.5	Cables and conductors are terminated at accessories in accordance with manufacture's specifications and regulatory requirements.
	2.6	Procedures for referring non-routine events to immediate supervisor for directions are followed.
	2.7	Fire protection installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.
3 Set up basic fire detection and warning systems.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Fire protection system is documented in accordance with regulatory requirement and established routines.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and positioning and terminating fire detection and warning system apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

- **KS01-EH161A Fire detection and warning system and apparatus**
- Evidence shall show an understanding of fire protection technologies, fire detection and warning systems, technical standards and regulations and working safely on or around fire protection equipment to an extent indicated by the following aspects:
- T1 Regulation governing fire protection and warning system installations
- T2 Applying Standards and Codes for fire protection systems and equipment encompassing:
- Standards mandated under regulation or by an authority, deemed-to-comply standard and local service requirements and codes include those applicable to electrical safe working practices
- Installation arrangement
- Certified/approved fire equipment
- Installation of fire equipment
- Testing and verification
- Final commissioning verifications
- T3 Purpose of fire alarm and warning systems
- T4 Purpose and operating principles of fire detection and warning systems.
- T5 Operating principles and characteristic of the various types of fire alarm detectors.
- T6 Operating principles and characteristic of the various warning system components
- T7 Effective and ineffective locations for fire detection devices and common causes of false alarms.
- T8 Warning devices and their operating parameters
- T9 Common operational requirements and types of control and indicating equipment.
- T10 Common operation and types of field data gathering equipment
- T11 Common operation and interface connections to other systems.
- T12 Purpose and interface requirements to smoke hazard management system
- T13. Life and safety concerns for fire protection.
- T14. Basic principles of combustion

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REQUIRED SKILLS AND KNOWLEDGE

- T15. Bi-products of combustion that can be detected
- T16. Basic principles of fire behaviour within and enclosure
- T17. Types of fire protection systems and the difference between automatic and passive systems and wet and dry systems.
- T18 Risks and control measures associated with fire protection equipment encompassing:
- Principle and purpose of risk management,
- Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents (arrangement of power distribution and circuits in an electrical installations, parts of an electrical system and equipment that operate at low-voltage and extra-low voltage, and parts of an electrical system and equipment where high-currents are likely).
- Procedures for isolating/reinstating and disconnection and reconnection of supplies in excess of extra-low voltage (Isolation and disconnection and reconnection are required to be performed by an appropriately qualified and authorise persons).
- Arrangements for isolating/reinstating fire protection systems to inhibit back-to-base signals to monitoring station.
- Arrangements for isolating/reinstating fire protection systems to inhibit alarms operating fire protection suppression equipment
- Arrangements for isolating/reinstating sections or parts of a fire protection system to inhibit alarms during building maintenance or system testing.
- Interface arrangements to isolate control functions between different fire protection building service systems
- Documentation and licensing requirements for working on fire protection systems
- Identification of personal and environmental hazards in working on fire protection systems.
- Control measures used for dealing with the hazards related to fire protection systems

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Position and terminate fire detection and warning system apparatus as described in 8) and including:

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A	Reading and interpreting drawings showing apparatus/device locations and connection arrangements.
B	Placing and securing devices and accessories accurately.
C	Maintaining fire integrity.
D	Terminating cable and conductors correctly.
E	Documenting installation.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to positioning and terminating fire detection and warning system apparatus.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of fire detection and warning system apparatus by installing at least two-fire alarm and warning systems.

Installation shall include the following system components:

- Fire alarm system with at least one control and indicating panel, 50 input devices, 5 output device and 2 system interface controls on at least of the following: Analogue addressable system, addressable system and or conventional system.
- Fire warning system with at least one control and indicating panel, 50 speakers, 5 interface communication devices and 2 warning indicators

  Note:

  1. Input devices can be conventional, analogue or analogue addressable fire detectors, flow switch connections or switch connections and the like.

  2. Output devices can be shutdown signal, door or system release controls, solenoid valve controls and the like.

  3. System interface controls can be communication signals to remote Control and indicating equipment, Building monitoring systems, paging system, Colour graphics and or the like.

  4. Interface communication devices can be Warden In communication phones, Remote PA inputs and the like.

  5. Warning Indicators are flashing lights for hearing impaired persons, fire brigade building indication and the like.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH162A Verify compliance and functionality of fire protection system installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers testing and visual inspection for verifying that a fire protection system and components are safe, and complies with requirements and functions as intended. It encompasses working safely, conducting compliance tests, conducting visual inspections, identifying non-compliance defects and mandatory reporting requirements.

Application of the Unit

Application of the Unit

2)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work. Where the fire alarm system has a call-back-to-base facility practice in the workplace is also

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License to practice **3)**

subject to ACMA regulations to undertake cabling work.

Note:

Unit 'UEENEEF102A' provides the required skill and knowledge for registration in accordance with ACMA regulations for undertaking cabling work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH161A	Install fire detection and warning system apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each

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scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to verify fire protection installations	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure

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ELEMENT	PERFORMANCE CRITERIA	
		the work is co-ordinated effectively with others involved on the work site.
	1.5	Location of system components is determined from specifications and diagrams.
	1.6	Inspection and tests are appropriately sequenced in accordance with job schedule.
	1.7	Materials needed for the tests and verification are obtained in accordance with established procedures and checked against job requirements.
	1.8	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
2 Visually inspect the installation	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Cabling/wiring is checked for appropriate type and size.
	2.4	Cabling/wiring, accessories and fire alarm warning components are validated as being suitably located, securely fixed and suitably protected from damage or corrosion.
	2.5	Accessories and components are validated as being appropriately rated and meeting functional requirements.
	2.6	Evidence that equipment complies with safety and functional requirements is cited.
	2.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.

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ELEMENT		PERFORMANCE CRITERIA	
			Inspection is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Conduct tests	3.1	OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Back-to-base facilities and other system interfaces are isolated in accordance with established procedures.
		3.3	Testing or measuring on a live and operating system in strict accordance with OHS requirements and within established safety procedures.
		3.4	Circuits/machines/plant/other system interfaces are checked as being isolated to ensure the system is not activated during testing in strict accordance OHS requirements and procedures.
		3.5	Electrical tests are conducted to verify that the electrical circuit within the fire installation are safe and function as intended.
		3.6	System tests are conducted to verify that the fire protection equipment and cabling/wiring within the fire protection installation is safe and functions as intended.
		3.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		3.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
		3.9	Testing is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
4	Report inspection and verification findings	4.1	OHS work completion risk control measures and procedures are followed.
		4.2	Work site and equipment is cleaned and made

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ELEMENT	PERFORMANCE CRITERIA	
		safe in accordance with established procedures.
	4.3	Non-compliance defects are identified and reported in accordance with established procedures.
	4.4	Recommendations for rectifying defects are made in accordance with established procedures.
	4.5	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Evidence shall show that knowledge has been acquired of safe working practices and verifying compliance and functionality of fire protection installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH162A Fire protection installations, testing and verification methods

Evidence shall show an understanding of methods for testing and verifying compliance and functionality of fire protection installation to an extent indicated by the following aspects:

2.7.5.3

T1. Mandatory and optional testing and verification requirements applicable to fire protection installations.

T2. Testing techniques

T3. Features of fire protection installations that can be visually inspected

2.9.37

Evidence shall show an understanding of fire alarm and warning system routine testing to an extent indicated by the following aspects:

T1. Types and uses of test equipment

T2. Fire alarm and warning system components and their location

T3. Periodic testing requirements to meet manufacturer’s and standards requirements

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Evidence Guide

EVIDENCE GUIDE

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The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Verify compliance and functionality of fire protection installations as described in 8) and including:

Identifying visual defects.

Conducting all electrical tests safely and correctly.

Conducting all fire alarms and warning tests safely and correctly.

Identifying non-compliant defects from test results.

Recommending appropriate corrective actions.

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Acting within regulatory limits.

Reporting legibly and accurately.

Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to verifying compliance and functionality of fire protection installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This unit shall be demonstrated in relation to at least two different new or existing fire protection installations and shall include:

The following components:

- Fire alarm system with at least 50 input devices, 20 output device and 2 system interface controls
- Fire warning system with at least 5 speakers, 5 interface communication devices and 2 warning indicators
- Voice message facilities

Note:

1. Input devices can be conventional, analogue or analogue addressable fire detectors, flow switch connections or switch connections and the like.

2. Output devices can be shutdown signal, door or system release controls, solenoid valve controls and the like.

3. System interface controls can be communication signals to remote Control and indicating equipment, Building monitoring systems, paging system, Colour graphics and or the like.

4. Interface communication devices can be Warden In communication phones, Remote PA inputs and the like.

5. Warning Indicators are flashing lights for hearing impaired persons, fire brigade building indication and the like.

Verification by:

- Visual inspection of cabling/wiring, accessories and controls
- Conducting electrical tests

Note:

1. Electrical testing includes isolation testing; insulation resistance of equipment; resistance of the internal circuits of equipment; polarity of supply and equipment; continuity of earthing; correct electrical connections load current.

2. Electrical testing may be limited by the scope permitted under restricted electrical work

- Conducting system tests as required by regulations

Note:

1. System testing includes weekly requirements to annual performance verification

2. Examples of tests are operation and control of indicating equipment, in-situ testing of detectors, taking sound measurements and the like

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these

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RANGE STATEMENT

and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH163A Enter and verify programs for fire protection systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers programming fire protection systems that include multiple connected detection, warning and fire control devices and remote monitoring. It encompasses working safely, applying knowledge of fire protection scenarios, using fire protection standards and protocols, entering system instructions, testing functionality of fire protection components and system operation, and documentation of commissioning activities.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may be used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Note:1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH161A	Install fire detection and warning system apparatus
UEENEEH162A	Enter and verify programs for fire protection systems

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to enter operating instructions	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the

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ELEMENT		PERFORMANCE CRITERIA	
			work.
		1.3	Safety hazards that have not previously been identified are reported and advise on risk control measures are sought from the work supervisor.
		1.4	The extent of programming work is determined from job specifications and in consultation with appropriate person(s).
		1.5	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
		1.6	Device installation is checked for compliance with job specification and regulations where they apply.
2	Enter software operating instructions	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.3	The required status of each function of the device is entered and their parameters set in accordance manufactures programming instructions.
		2.4	Entered data are checked as meeting those specified by the work job specification.
		2.5	Methods for dealing with unexpected situations are decided on the basis of safety and required work outcomes.
		2.6	Programming is carried out efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or other services.
3	Test device operation and report	3.1	Device operation is tested in strict accordance OHS requirements and procedures.
		3.2	Operating anomalies are identified and corrected

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ELEMENT	PERFORMANCE CRITERIA	
		in accordance with established routines.
	3.3	OHS work completion risk control measures and procedures are followed.
	3.4	Work site is cleaned and made safe in accordance with established procedures.
	3.5	Work completion is reported and an appropriate person or persons notified in accordance with established routines.

Required Skills and Knowledge

QUIRED SKILLS AND KNOWLEDGE

8) Evidence shall show that knowledge has been acquired of safe working practices and verifying programs in preparation for commissioning fire protection systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH163A Fire protection system programming methods

Evidence shall show an understanding of fire protection systems programming methods to an extent indicated by the following aspects:

2.4.51

T1. Vender programming codes and functions encompassing:

- Input/output instruction
- Variable
- Timers
- Limitations of vender software

T2. Program loading methods using a personal computer

T3. Program testing methods

T4. Program back up, version control and documentation requirements

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Evidence Guide

EVIDENCE GUIDE

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The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria & range
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices & workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Enter and verify programs in preparation for commissioning fire protection systems as described in 8) and including:

    a. Understanding required operating functions and parameters.

    b. Identifying non-compliance conditions of device installation.

    c. Entering functions and parameters correctly.

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d. Correcting programming anomalies.
e. Testing and verify device operation.
f. Program backups, version controls and documentation.
g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to entering and verifying programs in preparation for commissioning fire protection systems

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’

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Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Range Statement

RANGE STATEMENT

10) This unit shall be demonstrated in relation to entering and verifying programs in preparation for commissioning fire protection systems in at least two types of microprocessor fire protection control and indicating equipment. Programming shall include the following parameters:

- At least 50 input devices
- At least 20 output device
- At least 1 system interface control
- At least 2 logic timers
- System variables

Note:

1. Input devices can be conventional alarm zones, analogue or analogue addressable fire detectors, flow switch connections or switch connections and the like.

2. Output devices can be shut down signal, door or system release controls, solenoid valve controls and the like.

3. System interface controls can be communication signals to remote control and indicating equipment, Building monitoring systems, paging system, colour graphics and or the like.

4. Logic times can be software programs that control the operation of non-latching detectors, timer periods before operation of fire system suppression systems and or the like.

5. System variables can be standard software functions that operate AS 1668 smoke detector controls, dual zone alarm configurations, alarm and fault global functions and the like.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH164A Commission large fire protection systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers commissioning fire protection systems that include multiple connected detection, warning and fire control devices and remote monitoring. It encompasses working safely, applying knowledge of fire protection scenarios, using fire protection standards and protocols, entering system instructions, testing functionality of fire protection components and system operation, and documentation of commissioning activities.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH161A	Install fire detection and warning system apparatus
UEENEEH162A	Enter and verify programs for fire

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Prerequisite Unit(s) **4)**

	protection systems
UEENEEH163A	Commission large fire protection systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	44	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to commission	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of commissioning is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to program and commission are obtained in accordance with established procedures and checked for correct operation and safety.
2 Commission fire protection systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fire protection system components are verified as complying with design specifications and regulations.
	2.5	Fire protection devices are checked for correct location and alignment.
	2.6	Fire protection functions are tested in accordance

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ELEMENT	PERFORMANCE CRITERIA	
		with commissioning requirements.
	2.7	Sources of fire protection system anomalies are identified and corrected.
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.10	Commissioning activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report programming and commissioning activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	‘As-installed’ fire protection system is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Evidence shall show that knowledge has been acquired of safe working practices and commissioning commercial fire protection systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH164A **Fire protection systems, commissioning process**

Evidence shall show an understanding of the commissioning process of fire protection systems to an extent indicated by the following aspects:

2.9.79.2

T1. Purpose of commissioning

T2. Commissioning planning and documentation

T3. Initial tests and adjustments

T4. Commissioning procedures

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside

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the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Commission commercial fire protection systems as described in 8) and including:

  a. Identifying the extent of the fire protection system.
  b. Verify compliance of components.
  c. Testing system functionality.
  d. Identifying and correcting function anomalies.
  e. Documenting ‘as-installed’ system correctly.
  f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to commissioning commercial fire protection systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to commissioning at least two different fire alarms and warning systems. Commissioning shall include the following system components:

- Fire alarm system with at least 50 input devices, 20 output device and 2 system interface controls
- Fire warning system with at least 50 speakers, 5 interface communication devices and 2 warning indicators.
- Voice message facilities

Note:

1. Input devices can be conventional, analogue or analogue addressable fire detectors, flow switch connections or switch connections and the like.

2. Output devices can be shutdown signal, door or system release controls, solenoid valve controls and the like.

3. System interface controls can be communication signals to remote control and indicating equipment, Building monitoring systems, paging system, colour graphics and or the like.

4. Interface communication devices can be Warden In communication phones, Remote PA inputs and the like.

5. Warning indicators are flashing lights for hearing impaired persons, fire brigade building indication and the like.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH165A Troubleshoot fire protection systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers troubleshoot fire protection systems that include multiple connected detection, warning and fire control devices and remote monitoring to the sub-assembly level. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH161A	Install fire detection and warning system apparatus
UEENEEH162A	Enter and verify programs for fire protection systems
UEENEEH163A	Commission large fire protection systems
UEENEEH164A	Troubleshoot fire protection systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and rectify faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The likely extent of work to be undertaken is envisaged from fault/breakdown reports and/or discussions with appropriate person(s).
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Find and repair faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant/system interfaces are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	2.5	Fault finding is approached methodically drawing on knowledge of fire protection systems and components using measured values of system parameters.
	2.6	System components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.7	Faulty system/components are rechecked and their fault status and confirmed.
	2.8	Materials/replacement parts required to rectify faults are sourced and obtained in accordance with established procedures.
	2.9	Effectiveness of the repair is tested in accordance with established procedures.
	2.10	Apparatus is reassembled, finally tested and prepared for return to service.
	2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.

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ELEMENT	PERFORMANCE CRITERIA	
	2.12	Fault finding and repair activities are carried out without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Completion and report fault finding and repair activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.
	3.3	Fault finding and repair work activities are documented in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in fire protection systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

Fire protection systems' faults

Evidence shall show an understanding of technical fault finding to an extent indicated by the following aspects:

2.2.3

T1 Factors to consider in clarifying the nature of a fault encompassing:

- Initial fault report
- Confirmation of symptoms of the fault
- Comparison of symptoms with normal operation

T2 Effect to cause reasoning — assumptions of possible causes

T3 Methods for testing assumptions encompassing:

- Visual inspection
- Sectional testing
- Split-half tests
- Component isolation

T4 Dealing with intermittent faults

Note:

Typical causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference.

2.2.4

Evidence shall show an understanding of problem solving concepts and techniques as they apply in the workplace, to an extent indicated by the following aspects:

T1 Identify problems

Note.

Examples may include: Process and quality problems; Equipment selection, availability and failure; Teamwork and work allocation problems; Safety and emergency situations and incident; Performance gaps; Profit improvement and the like.

T2 Mathematical Tools

Note.

Examples may include: Average, Standard deviation and the like.

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REQUIRED SKILLS AND KNOWLEDGE

T3 Use of analytical techniques in problem solving

Note.

Examples may include: Brainstorming; Fishbone diagrams/cause and effect diagrams; Logic trees; Process logic/process requirements; Similarity/difference analysis; Pareto analysis; Force field/SWOT analysis.

T4 Using tools to assistance in problem solving

Note.

Examples may include: Procedures and work instructions; Safety data sheets; Job cards; Maintenance logs; Plant drawing.

T5 Determine corrective action encompassing:

- Tools
- Mode of communication procedure used within each enterprise
- Established work procedures and policies
- Size and structure of the teams/enterprise
- Group goals - team, section, enterprise
- Enterprise specific conflict resolution procedures
- Action plans
- Priority requirements
- Measurable objectives
- Resource requirements
- Methods for reaching objectives
- Timelines
- Safety requirements
- Risk assessment
- Environmental requirements

T6 Communicate recommendations

Note.

Examples may include: Feedback requirements; Corrective action and analysis; Following up recommendations and the like.

T7 Implement Monitoring encompassing:

- Identifying components to be measured
- Measurement and monitoring techniques
- Measurement and monitoring tools

2.9.79

Evidence shall show an understanding of fire protection technologies to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Life and safety concerns for fire protection.

T2 Basic principles of combustion

T3 Bi-products of combustion that can be detected

T4 Basic principles of fire behaviour within and enclosure

T5 Types of fire protection systems and the difference between automatic and passive systems and wet and dry systems.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

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- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in fire protection systems as described in 8) and including:

  a. Envisaging the likely extent of work from fault/breakdown reports and discussion with appropriate person(s).

  b. Using methodical fault finding techniques.

  c. Finding faults efficiently.

  d. Rectifying faults effectively.

  e. Completing documentation correctly.

  f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved

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industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in fire protection systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This unit shall be demonstrated in relation to:

Both a fire alarm and warning systems that include at least the following system components:

- Fire alarm system with at least 50 input devices, 20 output device and 2 system interface controls
- Fire warning system with at least 50 speakers, 5 interface communication devices and 2 warning indicators.
- Voice message facilities

Note:

1. Input devices can be conventional, analogue or analogue addressable fire detectors, flow switch connections or switch connections and the like.

2. Output devices can be shutdown signal, door or system release controls, solenoid valve controls and the like.

3. System interface controls can be communication signals to remote control and indicating equipment, Building monitoring systems, paging system, colour graphics and or the like.

4. Interface communication devices can be Warden In communication phones, Remote PA inputs and the like.

5. Warning indicators are flashing lights for hearing impaired persons, fire brigade building indication and the like.

Finding and repairing any six of the following faults in fire alarm and warning systems:

- Open-circuit
- Short-circuit
- Incorrect connections
- Insulation failure
- Program failure
- Apparatus/component failure
- Related mechanical failure
- Electrical induced interference
-
- Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH166A Troubleshoot microcontroller based hardware systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers determining correct operation of microcontroller systems. It encompasses working safely, problem solving procedures, providing solutions derived from measurements and calculations to predictable faults in microcontroller hardware.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not

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License to practice **3)**

require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on microcontroller hardware	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of microcontroller hardware problems is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with

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ELEMENT	PERFORMANCE CRITERIA	
		established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve microcontroller hardware and firmware problems	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Established methods are used to solve problems from measured and calculated values as they apply to microcontroller hardware.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Evidence shall show that knowledge has been acquired of safe working practices and fault finding microcontroller based hardware.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH166A Microcontroller based system troubleshooting

Evidence shall show an understanding of microcontroller-based systems troubleshooting, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Microcontroller systems overview

- Digital Systems Concepts Associated with Microcontroller based systems.
- Microcontroller architecture
- Microcontroller System block diagram
- Microcontroller manufacturers

T2. Program storage types

- Software
- Memory Terminology Hardware
- Secondary Memory and Useage

T3. Data storage types

- ROM
- RAM
- FLASH
- EEPROM

T4. I/O Ports: analogue/ digital

- Ports
- Interfacing with I/O devices (e.g. switches, LEDs, DC motors, LDRs, etc)

T5. Integrated Peripherals: timers, interrupts etc

- Introduction to timers/counters
- Introduction to interrupts

T6. Control circuitry: system clock, reset etc

- System clock circuitry
- Reset circuit
- Communication circuitry (e.g. serial port, etc)

T7. Writing, testing and debugging code (eg. Micro controller instruction set)

- Addressing modes
- Using an industry standard programming environment to develop code

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REQUIRED SKILLS AND KNOWLEDGE

T8. Electronic fault finding techniques

- Fault identification techniques
- Test equipment, safe operating procedure, application and in circuit connection.

T9. Methods:

- Visual inspection
- Sectional testing
- Split-half tests
- Component isolation
- Dealing with intermittent faults

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material rries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Fault find Microcontroller based hardware as described in 8) and including:

  a. Using methodical problem solving methods.

  b. Taking measurements correctly and accurately.

  c. Calculating parameters correctly and accurately.

  d. Providing solution to microcontroller component/circuit problems.

  e. Providing written justification for the solutions to problems.

  f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment,

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conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to fault finding Microcontroller based hardware.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

Repairs basic electronic apparatus faults by replacement of components

Troubleshoot digital sub-systems

Troubleshoot amplifiers in an electronic apparatus

Find and repair microwave amplifier section faults in electronic apparatus

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solving at least two of the following types of microcontroller hardware problems.

- Determining the operating parameters of an existing circuit
- Alternating an existing circuit to comply with specified operating parameters
- Developing circuits to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH167A Commission electronics and communications systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers undertaking commissioning procedures of electronics and communications systems to comply with predetermined parameters and delivery to client. It encompasses safe working practices, system parameter testing, analysis and adjusting to assure optimum performance, following procedures, and documenting final operating parameters and settings.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a licence to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to

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License to practice **3)**

practice this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to commission electronics and communications systems	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	System operating parameters are identified by reviewing system specifications and component technical data.

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Tools, equipment, applications, and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.7	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
		1.8	Circuits are checked as being isolated, where necessary, in strict accordance OHS requirements and procedures.
2	Commission electronics and communications systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular system.
		2.3	Measurements and adjustments are made to electronics and communications equipment to provide optimum system performance in accordance with system specifications and/or regulatory requirements.
		2.4	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
		2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.6	Systems' commissioning procedures are performed in accordance with requirements.
		2.7	Commissioning is carried out efficiently without unnecessary waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report commissioning activities	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Adjustment settings are documented in accordance with established procedures.
	3.3	Work site is cleaned and made safe in accordance with established procedures.
	3.4	Commissioning results and work completion are notified to appropriate person or persons in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and commissioning computer systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH167A Electronic and communication systems commissioning

T1. Commissioning processes

- Purpose of commissioning
- Commissioning planning and documentation
- Procedures for commissioning systems encompassing:
  a. Configuring
  b. Calibrating
  c. Tuning
  d. Validating system performance to specification
  e. Procedures followed to commission instrument systems
- Purpose and importance of documentation

T2. Project to be carried out in accordance with current OH&S procedures.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package..

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Commission electronics and communications systems as described in 8) and including:

    a. Identifying system design performance parameters and requirements

    b. Measuring and adjusting system components to provide optimum system performance

    c. Ensuring system operates within regulatory and/or specification requirements

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d. Documenting adjustment settings with established procedures
e. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to commissioning electronics and communications systems.

Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package..

This competency standard unit shall be demonstrated in relation to commissioning two different types of electronics and communications systems and associated components and controls.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH168A Modify - redesign of electronics and communications systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers the modification and redesign of electronics and communications systems to augment existing systems for clients. It encompasses safe working practices, system parameter reconfiguration, analysis to assure optimum performance, following procedures, and documenting final modifications and settings.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a licence to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practice this unit in the workplace subject to regulations

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License to practice **3)**

for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in

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Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to modify-redesign of electronics and communications system(s)	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.

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ELEMENT	PERFORMANCE CRITERIA	
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	System operating parameters are identified by reviewing system specifications and component technical data.
	1.6	The limitations, use and operation of the system to be modified is established from original specifications, manufacturers' data and the like
	1.7	The extent of modification is determined from measurements, tests, inspections, system limitations and other relevant requirements
	1.8	Specifications and instructions for the modifications are documented in accordance with requirements and organisational procedures
	1.9	Tools, equipment, applications, and devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.10	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
2 Generate modification-redesign of electronics and communications system(s)	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Alternative modification arrangements are considered and discussed with appropriate personnel
	2.3	Safety, functionality and economic considerations are incorporated in the proposed modification design
		Proposed modification complies with all requirements and includes specifications and documentation for alteration of the system(s)
		Changes in the use and operation of the

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ELEMENT		PERFORMANCE CRITERIA	
			system(s) as a consequence of the proposed modification are included in the documentation
		2.4	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
		2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.6	Modification-redesign is carried out efficiently without unnecessary waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3	Completion and report modification-redesign activities.	3.1	OHS risk control work completion measures and procedures are followed.
		3.2	Proposed modification is checked under established procedures for compliance with all relevant requirements
		3.3	Work site is cleaned and made safe in accordance with established procedures.
		3.4	Proposed modification is submitted for appropriate organisational approval and, where applicable, statutory or regulatory approval
		3.5	Approved copies of the modification-redesign documents are issued, and copies retained, documented and stored in records in accordance with established procedures and requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and commissioning computer systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH168A Electronic and Communications Engineering design processes

Engineering design processes:

T1 The functional and non-functional requirements of a customer encompassing:

- scope of the project,
- non-functional requirements

  - Economics (time, cost) including total life-cycle costs
  - Design
  - Implementation (construction)
  - Maintenance (operation),
  - Decommissioning (recycling)
  - Aesthetics (quality)
  - Design objectives (specifications)

Note:

- Establishing the specifications by defining the problem and producing a solution to satisfy the customer.
- Creation of the design plan through solution synthesis by selecting or creating the solution
- Analysis
- Optimisation of the proposed solution
- Validations of the resulting design against the customer's needs
- Implementation of the selected design

T2 Project to be carried out in accordance with current OH&S procedures.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Modify-redesign of electronics and communications systems as described in 8) and including:

    a. Developing outlines of alternative redesigns.

    b. Developing the modified-redesigned system within the safety and functional requirements and budget limitations.

    c. Documenting and presenting modifications-redesigns effectively.

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d. Successfully negotiating system alteration requests.
e. Obtaining approval for final modified-redesigned system.
f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to modifying-redesigning electronics and communications systems.

Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to modifying-redesigning electronics and communications systems across two different and representative types of electronics and communications systems and associated components and controls.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electronics

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UEENEEH169A Solve problems in basic electronic circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers determining correct operation of single source parallel and series-parallel circuits and providing solutions as they apply to various electronic work functions. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in multiple path circuit.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit requires a licence to practice in the workplace where plant and equipment is directly connected to installation wiring that operates at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to

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License to practice **3)**

regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to work on electronic circuits	1.1	OHS procedures for a given work area are obtained and understood.
		1.2	OHS risk control work preparation measures and procedures are followed.
		1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve electronic circuit problems	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Established methods are used to solving circuit problems from measure and calculated values as

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ELEMENT	PERFORMANCE CRITERIA	
		they apply to electronic circuit.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in electronic circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH169A Electronics Circuit Principles

Evidence shall show an understanding of power supplies for electronics circuit principles, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Basic circuit configurations encompassing:

- circuit configurations are single source a.c. and d.c. circuits,
- series circuits,
- parallel circuits
- series-parallel circuits.

T2. The relationship between variable parameter in electrical /electronic circuits encompassing:

- Variables parameters –
  - voltage,
  - current,
  - resistance
  - impedance,
  - inductance,
  - capacitance
  - reactance.

T3. Behaviour of electrical /electronic circuits for various values of voltage, current, resistance, impedance, inductance, capacitance and reactance and variable parameters encompassing:

- single source circuits,
- series circuit configurations,
- parallel circuit configurations
- series-parallel circuit configurations

T4. Types of voltage testers, multimeters, clamp meters, continuity testers and insulation resistance testers and their application.

T5. Features of testing/measuring devices - safety, user calibration and parameter and range settings.

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REQUIRED SKILLS AND KNOWLEDGE

T6. Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- circuit arrangement of test/measuring devices

T7. Taking readings

T8. Storage, maintenance and care of test/measuring devices.

T9. Australian Standard quality assurance requirements for test equipment calibration certification.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package..

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
- Apply sustainable energy principles and practices as specified in the performance criteria and range; and
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. and

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- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

- Solving problems in electronic circuits as described in 8) and including:

a. Determining the operating parameters of an existing circuit.
b. Altering an existing circuit to comply with specified operating parameters.
c. Developing circuits to comply with a specified function and operating parameters.
d. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to in solving problems in electronic circuits.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to:

Single source parallel and series-parallel electronic circuits as they apply to operational circuit functions in relation to at least two of the following types of circuit problems and on at least two occasions:

- Determining the operating parameters of an existing circuit
- Altering an existing circuit to comply with specified operating parameters
- Developing circuits to comply with a specified function and operating parameters

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology

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UEENEEH171A Troubleshoot faults in television receivers

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of faults in signal processing and scanning and deflection sections of television receivers. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH119 A	Repair predictable faults in television receivers

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Find faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of chrominance and luminance signal processing and scanning and deflection sections of television receivers using measured and calculated values of apparatus parameters.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Materials/replacement parts required to rectify faults are sourced and obtained in accordance with established procedures.
	2.8	Effectiveness of the repair is tested in accordance with established procedures.
	2.9	Apparatus is reassembled, finally tested and prepared for return to service.
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.11	Fault finding activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or

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ELEMENT	PERFORMANCE CRITERIA	
		services and using sustainable energy practices.
3 Repair fault	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	3.3	Materials required for the repair work are sourced and obtained in accordance with established procedures.
	3.4	Repairs are affected efficiently without damage to other components, apparatus or circuits.
	3.5	Effectiveness of the repair is tested in accordance with established procedures.
	3.6	Apparatus is reassembled, finally tested and prepared for return to customer.
4 Completion and report fault finding and repair activities	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work area is cleaned and made safe in accordance with established procedures.
	4.3	Written justification is made for repairs to apparatus.
	4.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in television receivers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH171A Television Receivers Troubleshooting

Evidence shall show an understanding of power supplies for TV and VCR, television RF stages and television receivers troubleshooting, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 components providing RFI suppression protection, rectification and filtering in a typical TV power supply.

T2 safe working procedures to test the power supply circuitry of a typical “hot chassis” television receiver.

T3 The operation of series regulated power supplies as used in typical TV receiver/monitors and VCRs.

T4 Subsystem arrangements and the operating principles of series and shunt type TV/VCR SMPS.

T5 The operation of the SMPS control circuits in a TV/VCR.

T6 The operation of typical self-oscillating TV/VCR SMPS circuits.

T7 Techniques for locating and repairing faults in a defective SMPS in a typical TV/monitor or VCR.

T8 The operation of tuners found in typical TV receivers.

T9 Techniques for locating and repairing faulty components in VST and FST tuning systems in typical TV receivers or VCRs.

T10 Techniques for locating and repairing faults in typical vision IF circuits.

T11 The operation of and fault find a typical TV synchronous demodulator circuit.

T12 AGC circuits in typical TV receivers encompassing

- Operation
- Fault finding techniques

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in television receivers as described in 8) and including:

  a. Using methodical fault finding techniques.

  b. Finding faults efficiently.

  c. Replacing components without damage.

  d. Providing written justification for the repairs.

  e. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions

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incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in television receivers.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment

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and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of television receiver faults to find and repair faults in signal processing and scanning and deflection sections of television receivers.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH172A Troubleshoot communication systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of communication systems. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH146A	Solve fundamental electronic communications system problems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for

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ELEMENT	PERFORMANCE CRITERIA	
		correct operation and safety.
2 Find faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of communication systems using measured and calculated values of apparatus parameters.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Fault finding activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Repair fault	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures. Materials required for the repair work are sourced and obtained in accordance with established procedures. Repairs are affected efficiently without damage to other components, apparatus or circuits.

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ELEMENT		PERFORMANCE CRITERIA	
			Effectiveness of the repair is tested in accordance with established procedures.
			Apparatus is reassembled, finally tested and prepared for return to customer.
4	Completion and report repair activities	4.1	OHS work completion risk control measures and procedures are followed.
		4.2	Work area is cleaned and made safe in accordance with established procedures.
		4.3	Written justification is made for repairs to apparatus.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in communication systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH172A Electronic communications systems troubleshooting

?

T1. AM and FM tuners

- Superheterodyne receivers
- Operational characteristics and techniques used in AM and FM receivers
- Frequency modulation, stereo encoding and de-coding used in commercial FM transmissions
- Amplitude modulation and de-modulation used in commercial AM transmissions
- RF signal requirements for AM tuners
- RF signal requirements for stereo FM tuners

T2. Modulation and de-modulation

- AM principles Radio Communications System (Review)
- Operational characteristics and techniques used in AM
- Amplitude modulation and de-modulation used in commercial AM transmissions
- RF signal requirements for AM tuners
- Modulation
  - Envelope
  - Index and percentage modulation depth
  - Power in carrier and sidebands
  - Over modulation and "splatter"
- Sideband modulation terminology and techniques
- Transmissions

T3. Sideband modulation terminology and techniques

- Double-sideband (DSB),
- Single-sideband (SSB)
- Frequency domain representation
- Double-sideband signal (DSB)

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REQUIRED SKILLS AND KNOWLEDGE

- Single-sideband signal (SSB)
- Demodulation requirements for DSB and SSBRF Amplifiers

T4. IF principles

- IF principles and operation
- Intermediate frequency
- Down converters
- Amplification
- The diode demodulator circuit.

T5. RF circuits

- Introduction to RF Amplifiers
- RF Oscillators (eg, Hartley, Colpitts, Clapp)
- RF Mixers
- Attenuators
- Transmission lines – Impedance matching
- Terminations

T6. Frequency and phase modulation Principles

- Time and frequency domain representation, amplitude and frequency
- Frequency modulation (FM) production,
- Phase modulation (PM)
- Digital Encoding
- Spread spectrum
- Equivalent FM and PM (eg. – audio processing)
- Bessel function and distribution of sidebands,
- Modulation
  - Envelope
  - Index and percentage modulation depth
  - Power in carrier and sidebands
  - Over modulation and "splatter"
  - Sideband modulation terminology and techniques
- Bandwidth

T7. Frequency and phase de-modulation Principles

- FM Demodulation Circuits
- Frequency synthesizers (eg. PLL)

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REQUIRED SKILLS AND KNOWLEDGE

T8. Antennas

- Principles
- Half wave/quarter wave configurations
- Impedance matching networks
- Polarisation

T9. Transmitter and Receiver systems configurations

- High and low-level AM transmitters
- High and low-level FM transmitters
- Transmitter Power ratings
- Spectral purity (eg. harmonics, spuriousemissions and IMD)

T10. RF Filters

- Types (eg. Butterworth, Chebyshev, Bessel and Elliptical)
- Crystal filters
- Mechanical Filters

T11. RF Safety and precautions

- Effects of RF radiation on the human body and work practices to protect against radio frequency radiation.
- Standards, Codes and Regulations of ACMA regulation for power, frequency and antenna gain and Occupational Health &Safety.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in communication systems as described in 8) and including:

  a. Using methodical fault finding techniques.

  b. Finding faults efficiently.

  c. Replacing components without damage.

  d. Providing written justification for the repairs.

  e. Dealing with unplanned events by drawing on essential

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knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in communication systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended

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for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of communication systems' faults in finding and repairing faults in communication systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH173A Troubleshoot professional audio reproduction components

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repair of professional and high-end audio amplifiers, preamplifiers, receivers, graphic equalizers, speakers and the like. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to

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License to practice **3)**

regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH124A	Repair predictable faults in audio components

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with

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ELEMENT	PERFORMANCE CRITERIA	
		established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Find faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of audio reproduction components and circuits using measured and calculated values of apparatus parameters.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Fault finding activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Repair fault	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	3.3	Materials required for the repair work are sourced and obtained in accordance with

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ELEMENT	PERFORMANCE CRITERIA	
		established procedures.
	3.4	Repairs are affected efficiently without damage to other components, apparatus or circuits.
	3.5	Effectiveness of the repair is tested in accordance with established procedures.
	3.6	Apparatus is reassembled, finally tested and prepared for return to customer.
4 Completion and report repair activities	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work area is cleaned and made safe in accordance with established procedures.
	4.3	Written justification is made for repairs to apparatus.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in professional audio reproduction components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH173A Sound reproduction equipment troubleshooting

Evidence shall show an understanding of sound reproduction equipment troubleshooting, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Sound reproduction fundamentals encompassing:

- Sound wave propagation
- Timbre of sound
- Effects of other medium of sound waves
- Characteristics of the human ear
- Difference between mono and stereo
- Surround sound principles

T2 Audio electronics encompassing:

- Interpretation of circuit diagrams of audio amplifiers
- Adjustment and testing of the power output stage of an amplifier
- Specifications and measurements associated with voltage and power amplifiers
- Connections and phasing of equipment
- System control circuits

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices & workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in professional audio reproduction components as described in 8) and including:

  a. Using methodical fault finding techniques.

  b. Finding faults efficiently.

  c. Replacing components without damage.

  d. Providing written justification for the repairs.

  e. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions

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incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in professional audio reproduction components.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment

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and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of professional audio reproduction components' faults in finding and repairing four different faults in two different components of audio equipment.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH174A Troubleshoot audio - video recording equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repair of ACR, CD, VCR and DVD players/recorders. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH117A	Carry out repairs of predictable faults in video and audio replay/recording apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Find faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Fault finding is approached methodically drawing on knowledge of audio/video recording and replay components and circuits using measured and calculated values of apparatus parameters.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Fault finding activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Repair fault	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	3.3	Materials required for the repair work are sourced and obtained in accordance with

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ELEMENT	PERFORMANCE CRITERIA	
		established procedures.
	3.4	Repairs are affected efficiently without damage to other components, apparatus or circuits.
	3.5	Effectiveness of the repair is tested in accordance with established procedures.
	3.6	Apparatus is reassembled, finally tested and prepared for return to customer.
	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work area is cleaned and made safe in accordance with established procedures.
	4.3	Written justification is made for repairs to apparatus.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing in audio/video recording equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH174A Audio/video recording equipment troubleshooting

Evidence shall show an understanding of audio/video recording equipment troubleshooting, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 VCR basic principles encompassing:

- Installation and operation of a VCR
- Techniques used in magnetic tape recording
- Helical scanning process and FM magnetic recording principles
- Adjustment and replacement of components within mechanical sections
- Luminance signal processing stages
- Operation of electronic systems

T2 VCR fault finding encompassing:

- Faulty component location in the sections of a VCR
  - Mechanical components
  - luminance components
  - chroma components
  - servo control sections
  - system control sections
  - timer and display sections
  - power supply sections
  - sound sections
  - RF sections

T3 VCR advanced principles encompassing:

- The operation of the chrominance processing in practical circuits
- Control sections operated by microprocessors
- The operation of analogue and digital servo systems

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in audio/video recording equipment as described in 8) and including:

  a. Using methodical fault finding techniques.

  b. Finding faults efficiently.

  c. Replacing components without damage.

  d. Providing written justification for the repairs..

  e. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions

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incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in audio/video recording equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment

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and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of audio/video recording equipment faults in finding and repairing four different faults in two different audio/video recording and replay components.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field

11)

Electronics

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UEENEEH175A Troubleshooting in security system installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repair of security system installations. The unit encompasses safe working practices, interpreting circuit diagrams, applying knowledge of security systems to logical fault finding procedures, rectifying faults/malfunctions, and safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEH150	Assemble and set up basic security

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Prerequisite Unit(s) **4)**

A	systems
UEENEEH154 A	Program and commission commercial security systems
UEENEEH155 A	Program and commission commercial access control security systems
UEENEEH156 A	Program and commission commercial security closed circuit television systems
UEENEEH153 A	Program and test large security systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to find and rectify faults and malfunctions	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Find and rectify faults and malfunctions	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Fault finding is approached methodically drawing on knowledge of security systems, circuits and diagnostic tools.
	2.5	Faulty security cables or terminations are identified, their fault status confirmed and repair or replace in accordance with established procedures.
	2.6	Faulty or malfunctioning security devices are identified, their fault status confirmed and readjusted or replace in accordance with established procedures.
	2.7	Malfunctions in security system software are identified and rectified following established routine procedures.
	2.8	Effectiveness of the repaired component is tested in accordance with established procedures.
	2.9	Apparatus is reassembled, finally tested and prepared for return to customer.
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.11	Fault finding and repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Completion and report fault finding and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Written justification is made for repairs to apparatus including components and materials used.
	3.4	Acceptance that the reported fault(s) have been repaired is sought from an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and rectifying faults and malfunctions in security system installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH175A Security systems installation faults

Evidence shall show an understanding of security systems installation to an extent indicated by the following aspects:

T1. Sub-system components (i.e. functional blocks) and their operating parameters

T2. Factors effecting system performance

T3. Typical faults, their symptoms and cause.

Note.

Faults include circuit, hardware and software faults

T4. Fault diagnosis procedures and testing

Note.

Faults confined to circuit and hardware faults and basic programming faults

T5. System adjustments

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria & range
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and rectify faults and malfunctions in security system installations as described in 8) and including:

  a. Using methodical fault finding techniques.

  b. Finding faults/malfunctions efficiently.

  c. Rectifying faults/malfunctions effectively.

  d. Providing written justification for the rectification work.

  e. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed

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items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and rectifying faults and malfunctions in security system installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential

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knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of security systems installations' faults/malfunctions in finding and rectifying at least four faults/malfunctions in two different types of security systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH176A Diagnose and rectify faults in electronic display circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of faults in cathode ray tubes, liquid crystal and plasma display circuits. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of display circuit components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

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License to practice **3)**

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH17 Troubleshoot faults in television receivers 1A

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading 4 Writing 4 Numeracy 4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others

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ELEMENT	PERFORMANCE CRITERIA	
		involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose display circuits faults employing measurements of circuit operating parameters referenced to display operating specifications.
	2.5	Suspected fault scenarios are tested as being the source of display circuit problems.
	2.6	Faults in the electronic components of the display circuits are rectified to raise display circuits to its operation standard.
	2.7	Circuits are tested to verify that the display operates as intended and to specified requirements.
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and consistent with job specifications and requirements.
	2.9	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that display circuit faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in display circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH176A Electronic displays faults

Evidence shall show an understanding of electronic displays faults, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Cathode ray tube displays encompassing:

- Operation and characteristics of various types of cathode-ray tubes including delta, in-line and precision in-line
- Voltages, statics and x-rays around CRTs
- Set up and adjustment techniques
- Rear and front projection TV systems
- Typical faults

T2. Plasma displays and their circuit control operation encompassing:

- Advantages of flat panel displays (over conventional CRT's, Raster geometry etc)
- Theory of plasma gas discharge and phosphor excitation
- Scanning techniques (column/row addressing
- Luminance/colour aspects (the need to re-address pixels to control light output
- Gamma correction considerations. (reversal of the gamma correction that is carried out at the TV studio to compensate for the non-linearity of light output of a conventional CRT)
- Plasma flat panel construction (and handling)

T3. Liquid crystal displays and the control circuit operation encompassing:

- Principles of transmissive LCD displays (as opposed to reflective types)
- Light polarisation. (polarisation twisting characteristics of liquid crystal and the
- need for polarisation filters in display panel)
- Voltage/current requirements and need for electric field
- Fluorescent back light (need for high frequency operation and power requirements)
- Scanning techniques (colour/row addressing and thin film transistors)
- Light attenuation (caused by the many layers/filters the back light has to pass through)
- Construction and handling

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REQUIRED SKILLS AND KNOWLEDGE

T4. Display circuit diagnostics encompassing:

- Sub-system components (i.e. functional blocks) and their operating parameters
- Factors effecting system performance
- Typical faults, their symptoms and cause.
- Fault diagnosis procedures and testing
- Sub-system adjustments

T5. Advance electronic measuring instruments encompassing:

- Test/measuring devices and their application - Examples are frequency counters, and synthesisers, spectrum analysers, noise and distortion meters and RF communications service monitor.

T6 Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- loading and matching
- storage and delay
- circuit arrangement of test/measuring devices

T7 Taking and interpreting readings

T8 Notion of decibels including dBm, dBr, dBu, dBo

T9. OHS enterprise responsibilities encompassing:

- Provisions of relevant health and safety legislation
- Principles and practice of effective occupational health and safety management
- Management arrangements relating to regulatory compliance
- Enterprise hazards and risks, control measures and relevant expertise required
- Characteristics and composition of workforce and their impact on occupational health and safety management
- Relevance of enterprise management systems to occupational health and safety management
- Analysis of working environment and design of appropriate occupational health and safety management systems
- Analysis of relevant data and evaluation of occupational health and safety system effectiveness
- Assess resources to establish and maintain occupational health and safety management systems.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in display circuits as described in 8) and including:

    a. Applying logical diagnostic methods.

    b. Using fault scenarios to test the source of circuit faults.

    c. Identifying the cause faults using logical diagnostic methods.

    d. Rectifying faults effectively.

    e. Verifying that the display operates correctly.

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f. Documenting fault rectification.
g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in display circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

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that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of display circuits by diagnosing and rectifying at least four circuit faults in two different types of displays.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH177A Diagnose and rectify faults in recording and replay equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of faults in SACD, DVD and DVDA recording and replay equipment. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of recording and replay apparatus components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

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License to practice **3)**

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH174 A	Troubleshoot audio/video recording equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose recording and replay apparatus faults employing measurements of circuit operating parameters referenced to recording and replay apparatus operating specifications.
	2.5	Suspected fault scenarios are tested as being the source of recording and replay apparatus problems.
	2.6	Faults in the electronic components of the recording and replay apparatus are rectified to raise recording and replay apparatus to its operation standard.
	2.7	Apparatus are tested to verify that the they operates as intended and to specified requirements.
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and consistent with job specifications and requirements.
	2.9	Diagnosis and rectification activities are carried out efficiently without waste of materials or

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ELEMENT	PERFORMANCE CRITERIA	
		damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that recording and replay apparatus faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in recording and replay apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH177A Recording and replay apparatus diagnostics

Evidence shall show an understanding of recording and replay apparatus diagnostics, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Diagnosing recording and replay apparatus encompassing:

- Sub-system components (i.e. functional blocks) and their operating parameters
- Factors effecting system performance
- Typical faults, their symptoms and cause.
- Fault diagnosis procedures and testing
- Sub-system adjustments

T2. Advance electronic measuring instruments encompassing:

- Test/measuring devices and their application - Examples are frequency counters, and synthesisers, spectrum analysers, noise and distortion meters and RF communications service monitor.

T3 Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- loading and matching
- storage and delay
- circuit arrangement of test/measuring devices

T4 Taking and interpreting readings

T5 Notion of decibels including dBm, dBr, dBu, dBo

T6. OHS enterprise responsibilities encompassing:

- Provisions of relevant health and safety legislation
- Principles and practice of effective occupational health and safety management
- Management arrangements relating to regulatory compliance
- Enterprise hazards and risks, control measures and relevant expertise required
- Characteristics and composition of workforce and their impact on occupational health and safety management
- Relevance of enterprise management systems to occupational health and safety management

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REQUIRED SKILLS AND KNOWLEDGE

- Analysis of working environment and design of appropriate occupational health and safety management systems
- Analysis of relevant data and evaluation of occupational health and safety system effectiveness
- Assess resources to establish and maintain occupational health and safety management systems.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment

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- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices & workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in recording and replay apparatus as described in 8) and including:

  a. Applying logical diagnostic methods.
  b. Using fault scenarios to test the source of apparatus faults.
  c. Identifying the cause faults using logical diagnostic methods.
  d. Rectifying faults effectively.
  e. Verifying that the recording and replay apparatus operates correctly.
  f. Documenting fault rectification.
  g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved

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industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in recording and replay apparatus.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of recording and replay apparatus by diagnosing and rectifying at least four circuit faults in two different types of recording and replay apparatus.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH178A Diagnose and rectify faults in camera circuits and equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of faults in camera circuits and equipment. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of camera circuit components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

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License to practice **3)**

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101 A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEH118 A	Fault find and repair electronic apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 4 Writing 4 Numeracy 4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion

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ELEMENT	PERFORMANCE CRITERIA	
		with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose camera circuit’s faults employing measurements of circuit operating parameters referenced to camera operating specifications.
	2.5	Suspected fault scenarios are tested as being the source of camera circuit problems.
	2.6	Faults in the electronic components of the camera circuits are rectified to raise camera circuits to its operation standard.
	2.7	Circuits are tested to verify that the camera operates as intended and to specified requirements.
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and consistent with job specifications and requirements.
	2.9	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable

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ELEMENT	PERFORMANCE CRITERIA	
		energy practices.
3 Complete and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that camera circuit faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in camera circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH178A Camera circuits and equipment diagnostics

Evidence shall show an understanding of camera circuits and equipment diagnostics, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Camcorders and digital cameras encompassing:

- Operation of camera circuits
- Recording media, standards and formats
- Pick up tubes and charge coupled devices
- Operation of optical transducers, lenses
- Colour separation techniques and signal processing
- Charge coupled devices
- Mechanics and adjustments
- Power supplies and batteries
- MPEG capability

T2. Camera circuit diagnosis encompassing:

- Sub-system components (i.e. functional blocks) and their operating parameters
- Environment factors effecting system performance
- Typical faults, their symptoms and cause.
- Fault diagnosis procedures and testing
- Sub-system adjustments

T3. OHS enterprise responsibilities encompassing:

- Provisions of relevant health and safety legislation
- Principles and practice of effective occupational health and safety management
- Management arrangements relating to regulatory compliance
- Enterprise hazards and risks, control measures and relevant expertise required
- Characteristics and composition of workforce and their impact on occupational health and safety management
- Relevance of enterprise management systems to occupational health and safety management
- Analysis of working environment and design of appropriate occupational health and safety management systems

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REQUIRED SKILLS AND KNOWLEDGE

- Analysis of relevant data and evaluation of occupational health and safety system effectiveness
- Assess resources to establish and maintain occupational health and safety management systems.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

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Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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- Diagnose and rectify faults in camera circuits as described in 8) and including:

a. Applying logical diagnostic methods.
b. Using fault scenarios to test the source of circuit faults.
c. Identifying the cause faults using logical diagnostic methods.
d. Rectifying faults effectively.
e. Verifying that the camera operates correctly.
f. Documenting fault rectification.
g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in camera circuits.

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Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of camera circuits by diagnosing and rectifying at least four circuit faults in two different types of cameras.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH179A Diagnose and rectify faults in digital television circuits and apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of faults in digital television apparatus. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of digital television apparatus circuit components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

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License to practice **3)**

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH176A	Diagnose and rectify faults in electronic display circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others

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ELEMENT	PERFORMANCE CRITERIA	
		involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose digital television apparatus faults employing measurements of circuit operating parameters referenced to apparatus operating specifications.
	2.5	Suspected fault scenarios are tested as being the source of apparatus problems.
	2.6	Faults in the electronic components of the digital television apparatus are rectified to raise digital television apparatus to its operation standard.
	2.7	Circuits are tested to verify that the apparatus operates as intended and to specified requirements
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and consistent with job specifications and requirements.
	2.9	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that apparatus faults have been rectified

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in digital television apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH179A Digital television faults

Evidence shall show an understanding of digital television receivers, digital television principles and digital television faults, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Integrated Receiver Decoder IRD (The Set Top Box) encompassing:

- sub-system components (i.e. functional blocks) and their operating parameters
- Basic diagnostic tests

T2. Channel decoders encompassing:

- Method used to determining the analogue to digital converter (ADC) sampling rate.
- Function of the Forward Error Correction (FEC) unit and Reed Solomon (RS) and Veterbi plus interleaving.
- Purpose of the OFDM modulator.
- Principle of operation of an OFDM demodulator and hierarchical (de) modulation.
- Principles of operation of a QPSK demodulator.
- Perform measurements and diagnostic test points in a typical IRD channel decoder.

T3. Conditional access encompassing:

- Purpose of a conditional access module (CAM).
- Access descrambler unit sub-system components (i.e. functional blocks) and their operating parameters
- Function of the component parts of conditional access descrambler unit.
- Purpose of a conditional access module 'smart card'.
- Single chip set top box sub-system components (i.e. functional blocks) and their operating parameters

T4. Repair and maintenance of digital television signal decoding circuitry. encompassing:

- Correct operation of the transport stream processor with reference to typical input and output signal.
- Testing techniques to determine correct operation of the video decoder, audio decoder and PAL encoder

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REQUIRED SKILLS AND KNOWLEDGE

- Testing techniques to determine identify faulty data streams.
- Pin connections of a SCART socket.
- Operation of a typical UHF modulator.
- List precautions to be observed when performing tests on functional and non-functional units.
- Identify and replace faulty components in malfunctioning units.
- Perform functional testing after repair.

T5. Describe the basic techniques used to process an analogue signal for integration in a digital broadcasting system encompassing:

- Basic technique of sampling an analogue waveform and assigning quantisation levels to those samples for both video and audio.
- Calculation of the number of pixel's per line and the sampling rate for a range of typical DTV aspect ratios.
- Typical sampling rates for Standard Definition Digital Television (SDTV) and High Definition Digital Television (HDTV) broadcasts.
- Range of different sampling structures used to sample luminance and colour difference signals.
- Determination of the total bit rate required for a required sampling rate.
- Factors limiting digital television picture quality.
- Minimum MPEG video requirements for HDTV and SDTV.
- Factors that create the need for video data compression.

T6. Describe the process used to prepare video data for integration encompassing:

- Major methods used to compress video data.
- How a complete picture frame is assembled from samples, blocks, macroblocks and slices.
- Meaning of the terms DCT coefficients, temporal frequency, and spatial frequency, temporal and spatial redundancy.
- Purpose of the Discrete Cosine Transfer (DCT) processor in the processing of video data compression.
- Relationship between spatial frequencies, DCT coefficients and quantisation levels in the DCT block.
- Compression techniques used to code quantised DCT coefficients.
- How Run Length Coding (RLC) is used to group DCT values into a series of values.
- How Variable Length Coding (VLC or Huffman coding) processes each DCT value according to probability.

T7. Describe the role of the DCT coder encompassing:

- Sub-system components (i.e. functional blocks) and their operating parameters of a DCT coder.
- Typical construction of a Group of Pictures (GOP).
- Individual frames in a GOP sequence that uses forward prediction and

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REQUIRED SKILLS AND KNOWLEDGE

bi-directional prediction.

- Purpose of differential coding.
- Structure of a video Packetised Elementary Stream (PES).
- Types of information included in the PES.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

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Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices & workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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- Diagnose and rectify faults in digital television apparatus as described in 8) and including:

a. Applying logical diagnostic methods.
b. Using fault scenarios to test the source of circuit faults.
c. Identifying the cause faults using logical diagnostic methods.
d. Rectifying faults effectively.
e. Verifying that the apparatus operates correctly.
f. Documenting fault rectification.
g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in digital television apparatus.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of digital television apparatus by diagnosing and rectifying at least four circuit faults in two different types of digital television apparatus.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH180A Diagnose and rectify faults in digital transmission circuits and systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of faults in digital transmission systems. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of digital transmission systems circuit components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

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License to practice **3)**

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH176A	Diagnose and rectify faults in electronic display circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others

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ELEMENT	PERFORMANCE CRITERIA	
		involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose digital television apparatus faults employing measurements of circuit operating parameters referenced to apparatus operating specifications.
	2.5	Suspected fault scenarios are tested as being the source of apparatus problems.
	2.6	Faults in the electronic components of the digital television apparatus are rectified to raise digital television apparatus to its operation standard.
	2.7	Circuits are tested to verify that the apparatus operates as intended and to specified requirements
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and consistent with job specifications and requirements.
	2.9	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that apparatus faults have been rectified

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in digital transmission systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH180A Digital television transmission faults

Evidence shall show an understanding of advanced digital television principles, digital television transmission towers and equipment and digital television transmission faults, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Audio component encompassing:

- Audio Encoding
- Audio Masking
- Audio sub band encoding

T2. Dolby AC-3

T3. MPEG-2 System Layer encompassing:

- PES Packet Construction
- Time Stamps
- Programme Clock Reference (PCR)
- Transport Packet Header
- Programme Specific Information (PSI)

T4. Channel Encoding

- Forward Error Correction (FEC)
- Bit Error Rate (BER)
- Puncturing

T5. Interleaving.

T6. Modulation

- Phase Shift Keying (PSK)
- Quadrature Amplitude Modulation (QAM)
- Orthogonal Frequency Division Multiplexing (OFDM)
- Coded Orthogonal Frequency Division Multiplexing
- (COFDM)

T7. Hierarchical Modulation.

- Terrestrial Channel Encoder

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REQUIRED SKILLS AND KNOWLEDGE

- Satellite Channel Encoder
- Carrier to Noise Ratio (C/N)

T8 Single Frequency Networks

- Guard Interval
- Megaframes

T9. The requirements of DTTB program input and monitoring equipment encompassing:

- basic system arrangement - Example is a central router connected to a number of control rooms.
- Terminologies - Examples are Vertical, Multi-level; Tie-line Routing and cross point
- typical signal types processed by a router.
- the purpose of "redundant CPU's and power supply units".
- common control protocols used in routers.
- typical analogue audio and video output voltage levels present at the router.
- typical specifications for digital data signals present at the router.
- function of various test equipment used in DTTB measurements.

T10. The operating characteristics of a digital television terrestrial broadcast (DTTB) transmitter encompassing:

- typical DTTB digital transmission system.
- safety precautions required when working with high power RF transmitters.
- operating characteristics of a typical MPEG encoder.
- operation of a coded orthogonal frequency division multiplex (COFDM) modulator.
- arrangement of subsystem components in a DTTB transmitter
- purpose of an up converter in a DTTB transmitter.
- typical characteristics of a DTTB power amplifier.
- advantages and disadvantages of air and liquid cooling systems used in transmitters.
- typical DTTB transmitter measurements techniques.

T11. The performance requirements of the DTTB combiner and antenna systems encompassing:

- minimum channel separation required between digital and analogue TV channels
- typical specifications of an antenna combiner system.
- the need for combiner systems in DTTB systems.
- typical system faults in combiners and antenna system.

T12. The requirements of remote monitoring and measurement equipment encompassing:

- purpose of control panel indicators and controls.

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REQUIRED SKILLS AND KNOWLEDGE

- Process by which the system manages a critical failure. -Example of component failure deemed as critical are power supplies and CPUs
- different system alarm signals.
- periodic equipment self tests and diagnostic routines on DTTB systems.
- DTTB systems fault diagnostic and rectification techniques.
- function of the basic components of a DTTB system.
- typical units of a DTTB Telemetry system

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

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equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in digital transmission systems as described in 8) and including:

  a. Applying logical diagnostic methods..

  b. Using fault scenarios to test the source of circuit faults.

  c. Identifying the cause faults using logical diagnostic methods.

  d. Rectifying faults effectively.

  e. Verifying that the apparatus operates correctly.

  f. Documenting fault rectification.

  g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to diagnosing and rectifying faults in digital transmission systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of digital transmission systems by diagnosing and rectifying at least four circuit faults in two different types of digital transmission systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH181A Design electronic printed circuit boards

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design of electronic printed circuit boards. The unit encompasses application of knowledge of electronic circuits, components, component assemblies, developing alternative design schemes based on design brief, customer relations and documenting designs.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design PCB assembly	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the proposed electronic circuits and sub assemblies is determined from the design brief or in consultations with appropriate person(s)
	1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site
2 Develop PCB assembly design	2.1	Knowledge of electronic components and sub assemblies and standards are applied to the design.
	2.2	Alternative arrangements for the design are considered based on the requirements outlined in the design brief.
	2.3	Safety, functional and budget considerations are incorporated in the design.
	2.4	PCB design draft is checked for compliance with the design brief and design rules.
	2.5	PCB design is documented for submission to appropriate person(s) for approval
	2.6	Solutions to unplanned situation are provided consistent with organisation policy.

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ELEMENT	PERFORMANCE CRITERIA	
3 Provide detailed assembly drawings and artwork files ready for production	3.1	PCB design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing printed circuit boards.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH181A Printed circuit board design techniques

Evidence shall show an understanding of printed circuit board design techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Component specifications and their implication in a given circuit.

T2. Sources of components and technical data.

- Sources of components and technical data. (eg. data sheets, manufacturer's data)
- Electrical and physical considerations
- Circuit/apparatus parameters and specification

T3. Printed circuit board techniques

- Printed circuit board materials and processes overview (eg. photographic, mechanical, thermal, dielectric)
- Types of Printed circuit boards (eg. single sided, double sided, multilayer)

T4. Factors influencing design

- Component placement
- Routing and auto-routing
- Design rules
- CAM tools (computer Automated manufacture)
- Version control

T5. Design tools and software

- Library components
- Preparing a schematic
- Documentation and version control

T6. Design standards

- Electronic symbols
- Circuit schematics and optimisation
- Printed circuit board manufacturing techniques

T7. MSDS materials and processes

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design printed circuit boards (PCB) boards as described in 8) and including:

    a. Developing outlines of alternative designs.

    b. Developing the design within the safety and functional requirements and budget limitations.

    c. Documenting and presenting design effectively.

    d. Successfully negotiating design alteration requests.

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e. Obtaining approval for final design.
f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment

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and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of printed circuit boards in relation to designing PCBs for different component population densities and related sub assemblies.

- Single sided PCB
- Doubled sided PCB
- Multi-layer PCB
- Analogue and digital circuits and components

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH182A Develop engineering solutions to RF amplifiers problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers developing engineering solutions to resolve problems with RF amplifiers. It encompasses working safely, applying extensive knowledge of RF amplifier circuits and device operation and their application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical RF amplifiers electronic problems are those encountered in meeting performance requirements and compliance standards, revising an RF amplifier electronic operating parameters and dealing with RF amplifiers electronic malfunctions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a

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License to practice **3)**

license to practice in the workplace for work involving direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop engineering solution for RF amplifiers electronic problems	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the RF amplifiers problem is determined from performance specifications and situation reports and in consultations with

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ELEMENT		PERFORMANCE CRITERIA	
			relevant persons.
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
		1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2	Develop engineering solution for RF amplifiers electronic problems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of RF amplifiers circuit, device operation, characteristics and applications are applied to developing solutions to RF amplifiers problems.
		2.3	Parameters, specifications and performance requirements in relation to each RF amplifiers problem are obtained in accordance with established procedures.
		2.4	Approaches to resolving RF amplifiers problems are analysed to provide most effective solutions.
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
		2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3	Test, document and implement engineering solution for RF amplifiers electronic problems	3.1	Solutions to RF amplifiers problems are tested to determine their effectiveness and modified where necessary.
		3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.
		3.3	Appropriately competent and qualified person(s) required to implement solutions to RF amplifiers

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ELEMENT	PERFORMANCE CRITERIA	
		problems are coordinated in accordance with regulatory requirements and enterprise policy. (See Note)
	3.4	Justification for solutions used to solve RF amplifiers problems is documented for inclusion in work/project development records in accordance with professional standards.

Note:

A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing solutions to RF amplifiers problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH182A RF amplifiers problems

T1. RF amplifiers

- Selection of RF components
- Frequency response of amplifiers
- Gain levelling techniques
- Tuned amplifiers
- Techniques for impedance matching capacitive and transformer coupling
- Double-tuned circuits
- Tapped C and L circuits for Z-matching (Examples are use of S parameters and Smith charts.)
- Small signal RF amplifiers and
- RF Power amplifiers class A,B,C,D - low power (1W) / high power (kWs) - typical circuits
- Power combiners
- Strip line circuit techniques

T2. Transmission lines and antennas

- Reflectometry minimum and maximum voltage and current values on a transmission line carrying an RF signal
- Transmission line loss measured in decibels
- EH field directions in relation to antenna elements

T3. OH&S

- Standards, Codes and Regulations of ACMA regulation for power, frequency and antenna gain and Occupational Health &Safety.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop solutions to RF amplifiers problems as described in 8) and including:

  a. Understanding the extent of the RF-amplifiers electronic problem.

  b. Forming effective strategies for solution development and implementation.

  c. Obtaining RF-amplifiers electronic parameters, specifications and performance requirements appropriate to each problem.

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d. Testing and solutions to RF-amplifiers electronic problems.
e. Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.
f. Documenting justification of solutions implemented in accordance with professional standards.
g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing solutions to RF amplifiers problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3

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'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of RF amplifier problems in developing engineering solutions for at least four RF amplifiers' electronic problems.

Note.

Typical RF amplifiers electronic problems are those encountered in meeting performance requirements and compliance standards, revising RF amplifiers electronic operating parameters and dealing with RF amplifiers electronic malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH183A Analyse the performance of wireless-based electronic - communication systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the analysis of wireless-based electronic systems to provide solutions to mobile communications performance. It encompasses working safely, applying extensive knowledge of mobile communications parameters, gathering and analysing data, applying problem solving techniques, developing and documenting results and solutions for use in design work.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It is intended to apply to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the

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License to practice **3)**

operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101 A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to analyse the performance of wireless-based systems	1.1	OHS processes and procedures for a given work area are obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the wireless-based electronic systems issues are determined from performance specifications and situation reports and in consultations with relevant persons
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
		1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2	Analyse the wireless-based electronic systems performance	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of wireless communications principles are applied to analytical solutions to electronic systems.
		2.3	Parameters, specifications and performance requirements in relation to wireless-based electronic systems are obtained in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Approaches to analysing wireless-based electronic systems parameters are carried out to provide the most effective solution.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3 Document and report on the results of the wireless-based electronic systems performance analysis and actions taken	3.1	Solutions to wireless-based electronic systems issues are evaluated to determine their effectiveness and modified where necessary.
	3.2	Analysis is documented including details of all findings, calculations and assumptions.
	3.3	Analysis is reported to appropriately personnel to establish appropriate action to be taken based on findings.
	3.4	Justification for findings and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and analysing the performance of wireless-based electronic systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH183A Wireless networks infrastructure

Evidence shall show an understanding of wireless networks infrastructure, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Networking fundamentals encompassing:

- How information is carried
- Signal distortion (Examples include attenuation, reflection, noise, dispersion, jitter, latency and collisions, Bit Error Rate)
- Types of networks, network components and hardware
- Local Area Network (LAN) architectures
- Networking protocols and the OSI model
- Network signal propagation
- Transmission Control Protocol / Internet Protocol (TCP/IP)
- Basics of Encoding Networking Signals
- Internet services

T2. Wireless networks infrastructure encompassing:

- Network configurations
- Wireless network security

T3. Fundamentals of wireless security encompassing:

- Wireless topologies
- Network Interface Cards (NICs)
- Access points
- Bridges
- Antennas
- Security
- Application design and site survey preparation
- Troubleshooting, management, monitoring and diagnostics
- Emerging technologies

T4. OH&S encompassing:

- Standards, Codes and Regulations of ACMA regulation for power, frequency and

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REQUIRED SKILLS AND KNOWLEDGE

antenna gain and Occupational Health & Safety.

- All tasks to be carried out in accordance with current OH&S procedures.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to

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its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse the performance of wireless-based electronic

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systems as described in 8) and including:

a. Understanding the wireless-based electronic systems performance issues.
b. Forming effective strategies for analysing wireless-based electronic systems performance.
c. Obtaining wireless-based electronic systems performance parameters, specifications and performance requirements appropriate to each situation.
d. Evaluating the results of the analysis.
e. Documenting analysis details of all findings, calculations and assumptions.
f. Documenting justification of actions to be implemented in accordance with professional standards.
g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

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The resources used for assessment should reflect current industry practices in relation to analysing the performance of wireless-based electronic systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of wireless-based electronic systems in analysing wireless-based electronic systems parameters in at least two different contexts.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH184A Modify digital signal processing (DSP) based sub-systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers modifying electronic DSP based sub-systems. It encompasses working safely, following design brief, apply knowledge of digital and analogue devices, interpreting device specifications, constructing prototypes, testing developed system prototype operation and documenting design and development work.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to modify DSP based systems	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the proposed electronic DSP based system is determined from the design brief or in consultations with appropriate person(s)
	1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site
	1.5	Materials and devices/components required for the work are determined on compatibility of their specifications with DSP based system requirements and project budget constraints.
2 Modify DSP based systems	2.1	OHS risk control measures and procedures are followed.
	2.2	Knowledge of digital and analogue elements used in DSP based systems and compliance standards are applied to the design
	2.3	Alternative arrangements for the modification are considered based on the requirements outlined in the design brief.
	2.4	Safety, functional and budget considerations are incorporated in the design.
	2.5	Prototype devices and circuits are constructed, programmed and tested for compliance with the design brief and regulatory requirements.
	2.6	Prototype malfunctions are rectified and retested to ensure effective operation of design.
	2.7	DSP based system modification is documented for submission to appropriate person(s) for approval

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ELEMENT	PERFORMANCE CRITERIA	
	2.8	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for electronic DSP based systems modification	3.1	DSP based system modification is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and modifying DSP based systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH184A Digital Signal Processing

Evidence shall show an understanding of digital signal processing, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. DSP development technologies

T2. Infinite Impulse Response (IIR) filter encompassing:

- pole-zero placement method to obtain coefficients for a simple first-order and second-order low-pass and band-pass IIR filter.
- direct-form realisation of a simple IIR filter suitable for sin(x)/x compensation.
- DSP system

T3 High-order IIR filter encompassing:

- filter design package to obtain the coefficients for a high-order IIR filter
- high-order IIR filter would be realised using a cascade or a parallel combination of first-order or second-order IIR filter blocks.
- effect of coefficient quantisation errors and calculation rounding-off errors on filter performance.
- IR filters and symmetrical FIR filters

T4 Discrete Fourier Transform (DFT) to a signal encompassing:

- discrete correlation.
- signal-detection.
- correlation used to generate DFT.
- window-function when generating the DFT.

T5 Concept of complex signals encompassing:

- positive-frequency and a negative frequency signal.
- exponential and polar form of sinusoidal signal and a complex sinusoidal signal.
- spectra of a general signal having equal real and imaginary components. (An “analytic” or “quadrature” signal).
- analytic signals simplification filtering operations

T6 Fast Fourier Transform (FFT) encompassing:

- Decimation in Time FFT, and the “twiddle factor”.

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REQUIRED SKILLS AND KNOWLEDGE

- sample-frequency and number of signal samples needed for a FFT.
- FFT routine.

T7 FIR filtering using FFT encompassing:

- overlap, save method of implementing a long FIR filter using the FFT and the inverse FFT.
- limitations on the stored frequency-response coefficients and the resulting impulse-response.

T8 Data-rate conversion encompassing:

- data-rate conversion (decimation) simplification of the anti-alias filter requirement
- data-rate conversion (interpolation) of the DSP system simplification the reconstruction-filter requirement and reduces the need for sin(x)/x compensation.

T9 Modulation and de-modulation techniques encompassing:

- Spectra where real signals and analytic (quadrature) signals are modulated by a sinusoidal function.
- amplitude-modulated signal
- single-sideband signal

T10 Digital processing steps in practical DSP applications

T11 Currently available DSP support chips

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1)**
	Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Modify DSP based systems as described in 8) and including:

  a. Developing the design modification within the safety and functional requirements and budget limitations.

  b. Documenting and presenting design effectively.

  c. Successfully negotiating design alteration requests.

  d. Obtaining approval for final modification.

  e. Documenting justification of actions to be implemented in accordance with professional standards.

  f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice

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using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to modifying DSP based systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of DSP based systems in relation to modifying an electronic DSP based system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH185A Design signal-conditioning subsystems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers designing signal-conditioning subsystems incorporating sensors and transducers and digital and analogue elements. It encompasses working safely, following design brief, apply knowledge of digital and analogue devices, interpreting device specifications, constructing prototypes, testing developed system prototype operation and documenting design and development work

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101 A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design signal-conditioning subsystems	1.1	OHS processes and procedures for a given work area are obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the proposed signal-conditioning subsystem is determined from the design brief or in consultations with appropriate person(s)
		1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site
		1.5	Materials and devices/components required for the work are determined on compatibility of their specifications with data acquisition system requirements and project budget constraints.
2	Design signal-conditioning subsystems	2.1	OHS risk control work measures and procedures are followed.
		2.2	Knowledge of digital and analogue elements used in signal-conditioning subsystems and compliance standards are applied to the design
		2.3	Alternative arrangements for the design are considered based on the requirements outlined in the design brief.
		2.4	Safety, functional and budget considerations are incorporated in the design.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Prototype devices and circuits are constructed, programmed and tested for compliance with the design brief and regulatory requirements.
	2.6	Prototype malfunctions are rectified and retested to ensure effective operation of design.
	2.7	The design is documented for submission to appropriate person(s) for approval
	2.8	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for signal-conditioning subsystems design	3.1	The design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for modifications to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing a signal-conditioning subsystem.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH185A Principles of Signal Conditioning

Evidence shall show an understanding of principles of signal conditioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Differential amplifiers of suitable characteristics to meet system objective

- differential gain, common mode rejection ratio and the required CMRR
- variable gain input stage
- connections for an instrumentation amplifier to meet given objectives.

T2. Audio frequency integrator working to given specifications

- ideal integrator
- practical difficulty with the ideal circuit
- common applications of the integrator.

T3. Operational amplifier circuits

- use of d.c. offset and capacitive blocking and Norton amplifiers powered by a single supply
- operation of single-supply inverting and noninverting amplifiers employing DC offset bias at the input and blocking capacitors
- operation of a high input resistance unity gain
- circuit symbol of the Norton (input current difference) amplifier
- areas of use for single-supply amplifiers.

T4. Comparator circuits (open loop, limited swing and hysteresis) using operational amplifiers:

- ideal op-amp comparator
- typical uses of the comparator.
- comparators with limited (i) negative swing and (ii) both positive negative swing
- hysteresis comparator with positive resistor divider feedback and calculate the input switching voltages.
- desirable properties of an operational amplifier for use as comparator and the characteristics of comparator op amps.
- op amp oscillators

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REQUIRED SKILLS AND KNOWLEDGE

T5. Amplifiers with given piecewise linear transfer characteristics

T6. Operation and building precision of half-wave and fullwave rectifiers

- precision two-diode half-wave rectifier
- typical applications of precision rectifiers.

T7. Operation of and build a sine - triangle – square function generator:

- block diagram of a sine-triangle-square signal generator using an integrator, comparator and sine-wave shaper.
- waveforms at various points in the circuit.
- frequency range and setting of frequency changes.
- Timer circuits
- function generators and oscillators.

T8. Sensors and transducers

- static and dynamic characteristics Sensor types encompassing:
  - strain and force
  - thermocouples
  - displacement, location, proximity
  - motion
  - light and radiation
  - pressure

T9. Feedback Control Systems basics

- closed loop systems
- open loop systems

T10. Actuators and Drive Systems

- types and characteristics
- Power Ics
- PLL circuits

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design signal-conditioning subsystems as described in 8) and including:

  a. Developing outlines of alternative designs.

  b. Developing the design within the safety and functional requirements and budget limitations.

  c. Documenting and presenting design effectively.

  d. Successfully negotiating design alteration requests.

  e. Obtaining approval for final design.

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f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing signal-conditioning subsystems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended

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for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of signal-conditioning subsystems in designing signal-conditioning subsystems incorporating sensors and transducers and digital and analogue elements.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH186A Commission satellite and microwave communication systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the setting-up and adjusting of satellite and microwave communication systems for optimum performance. It encompasses safe working practices, signal testing and analysis, adjusting equipment, following procedures and documenting.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It may be used to augment previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set-up process measuring instruments	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	Measurement parameters are identified by reviewing transmission/reception requirements and equipment manufacturer’s instructions.
	1.6	Tools, equipment and testing devices needed for

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ELEMENT	PERFORMANCE CRITERIA	
		the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.7	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	1.9	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
2 Set-up process measuring instruments	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular control system.
	2.3	Measuring instruments are set up and adjusted in accordance with transmission/reception requirements and equipment manufacturer's instructions.
	2.4	Adjustments are made to provide optimum transmission/reception performance within regulatory requirements.
	2.5	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.7	Setting-up is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report set-up activities	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Adjustment settings are documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and commissioning microwave and satellite communication systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH186A Electronic communications, satellite and microwave

Evidence shall show an understanding of electronic communications, satellite and microwave, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Propagation of electromagnetic waves through the atmosphere, transmission lines and waveguides including characteristic impedance, impedance matching, standing waves, microwave frequency bands

T2. Microwave device parameters involving wavelength, phase, VSWR, impedance matching, circuit parameters, amplifiers, transmission, reception, oscillation, noise figure, noise temperature

T3. Microwave devices and components

T4. Microwave operational constraints and operating parameters such as power, bandwidth, gain, efficiency, operational life, electrical parameters, stability, cooling, size, testing and device selection

T5. Microwave measurements, test equipment and testing techniques

T6. EMI/EMC, generation, suppression and reduction

T7. Satellite communications systems encompassing:

- Types of satellite systems and sub-systems
- Earth station locality and antenna parameters
- Link specifications and link calculations
- Base band signalling processes
- Modulation and system access

T8. Commissioning electronic communication systems encompassing:

- Purpose of commissioning
- Commissioning planning and documentation
- Initial tests and adjustments
- Commissioning procedures

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Commission microwave and satellite communications systems as described in 8) and including:

  a. Identifying measurement parameters.

  b. Setting-up and adjusting in accordance with communication systems requirements and equipment manufacturer's instructions.

  c. Documenting adjustment settings with established procedures.

  d. Dealing with unplanned events by drawing on essential

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knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to commissioning microwave and satellite communication systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended

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for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of microwave and satellite communication systems in setting-up and adjusting two microwave/satellite communication systems. It may include test plans.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH187A Solve problems in electronic musical equipment circuits

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers determining correct operation of valve instrument amplifiers and associated musical instrument circuits. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in musical equipment circuits and troubleshooting.

Application of the Unit

Application of the Unit **2)**

This competency standards unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training and approved training programs, and may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States and Territories

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License to practice **3)**

subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

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Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on musical equipment circuits	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of musical equipment circuit problems is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve musical equipment circuits' problems	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Established methods are used to solve problems from measure and calculated values as they apply to musical equipment circuits in an electronic apparatus.
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in musical equipment circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH187A Electronic Musical Instruments

Evidence shall show an understanding of electronic musical instruments, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Vacuum tubes encompassing:

- history
- construction
- principles of thermionic emission
- advantages and disadvantages compared with solid state devices
- applications

T2 Vacuum diodes encompassing:

- schematic symbol
- terminals
- operation and typical voltages
- rectifier circuits
- typical devices and part numbers

T3 Triodes, tetrodes, and pentodes encompassing:

- schematic symbols
- terminals
- operation and typical voltages
- bias requirements
- AC parameters

T4 Small signal valve amplifier stages encompassing:

- typical devices and part numbers
- typical configurations
- quiescent conditions
- AC conditions: gain, input impedance, bandwidth

T5 Valve power amplifier stages encompassing:

- typical devices and part numbers
- typical push-pull configurations

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REQUIRED SKILLS AND KNOWLEDGE

- output transformer
- reflected impedance
- parallel output arrangements
- quiescent conditions
- AC conditions
- output power

T6 Complete valve amplifiers encompassing:

- preamp stages
- coupling methods
- gain and master volume controls
- clean and “dirty” channels
- channel mixing
- valve tone controls
- spring reverb systems
- tremolo circuits
- effect sends
- foot switches
- differential amplifier
- phase splitter
- push-pull output configurations
- output transformer
- output impedance selection
- speaker connections
- local and global feedback arrangements

T7 Valve amplifier troubleshooting and servicing encompassing:

- safety considerations: high voltages, heat and glass
- testing procedures and importance of testing with a load
- troubleshooting techniques
- typical faults
- locating and replacing faulty components

T8 Electronic musical instruments encompassing:

- Electric guitar and bass wiring systems
- Active pickups
- Effects pedals and racks - principles of operation and basic circuits
- Electric keyboards, basic operation and circuits
- Troubleshooting and repairing musician instruments

T9 Advance electronic measuring instruments encompassing:

- Test/measuring devices and their application - examples are frequency counters, and synthesisers, spectrum analysers, noise and distortion meters and RF

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REQUIRED SKILLS AND KNOWLEDGE

communications service monitor.

T10 Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- loading and matching
- storage and delay
- circuit arrangement of test/measuring devices

T11 Taking and interpreting readings

T12 Notion of decibels including dBm, dBr, dBu, dBo

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package..

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

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  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Solve problems in musical equipment circuits as described in 8) Range: and including:

  a. Using methodical problem solving methods.

  b. Taking measurements correctly and accurately.

  c. Calculating parameters correctly and accurately.

  d. Providing solution to component/circuit problems.

  e. Providing written justification for the solutions to problems.

  f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit contains Employability Skills

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment

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it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in musical equipment circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with unit:

UEENEEH102A Repairs basic electronic apparatus faults by replacement of components

UEENEEH112A Troubleshoot digital sub-systems

UEENEEH114A Troubleshoot resonance circuits in an electronic apparatus

UEENEEH115A Develop software solutions for microcontroller based systems

UEENEEH116A Find and repair microwave amplifier section faults in electronic apparatus

UEENEEH139A Troubleshoot basic amplifier circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational

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health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated using a representative range of musical equipment circuits in solving at least two of the following types of musical equipment circuits problems:

- Determining the operating parameters of a valve amplifier and musical instrument circuit.
- Altering an existing valve amplifier or musical instrument circuit section to comply with specified operating parameters
- Developing a valve amplifier section or musical instrument circuit to comply with a specified function and operating parameters
- Finding and repairing a fault in a valve amplifier and musical instrument circuit section of an electronic apparatus

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

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UEENEEH188A Design and develop electronics - computer systems projects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design and development of electronics/computer systems projects. It encompasses working safely, designing, constructing, and recording, evaluating and reporting of an electronics/computer systems design project.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design and develop electronics/computer systems projects	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the proposed project development is determined from the design brief or in consultations with appropriate person(s).
		1.4	Project work is planned to meet scheduled timelines in consultation with others involved on the work site.
		1.5	Resources required for the work are selected based on compatibility with project requirements and budget constraints.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Design and develop electronics/computer systems projects	2.1	OHS risk control work measures and procedures are followed.
		2.2	Knowledge of devices and systems and compliance standards are applied to the design
		2.3	Alternative arrangements for the design are considered based on the requirements outlined in the design brief.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Safety, functional and budget considerations are incorporated in the design.
	2.5	Prototype hardware and/or software systems are constructed and tested for compliance with the design brief and regulatory requirements.
	2.6	Prototype malfunctions are rectified and retested to ensure effective operation of design.
	2.7	Project design is documented for submission to appropriate person(s) for approval.
	2.8	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for the design	3.1	The design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for modifications to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge of safe working practices and designing and developing electronics/computer systems projects has been acquired.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH188A Engineering design process

Evidence shall show an understanding of engineering design process, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Electronic measuring instruments encompassing:

- Test/measuring devices and their application - examples are analogue and digital multimeters, voltage and digital testers, signal generators and oscilloscopes

T2 Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- circuit arrangement of test/measuring devices

T3 Taking readings

T4 Storage, maintenance and care of test/measuring devices

T5 Engineering design processes

T6 The functional and non-functional requirements of a customer encompassing:

- scope of the project,
- non-functional requirements

Note:

Examples include economics (time, cost) including total life-cycle costs - design, implementation (construction), maintenance (operation), decommissioning (recycling); aesthetics (quality)

T7 Design objectives (specifications) to satisfy a given set of customer attributes

Note:

Establishing the specifications by defining the problem and producing a solution to satisfy the customer.

T8 Creation of the design plan through solution synthesis by selecting or creating the solution

T9 Analysis

T10 Optimisation of the proposed solution

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REQUIRED SKILLS AND KNOWLEDGE

T11 Validations of the resulting design against the customer's needs

T12 Implementation of the selected design

T13 Occupational health and safety fundamentals encompassing:

- underlying principles of OH&S
- general aims and objectives of the relevant state or territory legislation relating to OH&S.
- employer and employee responsibilities, rights and obligations.
- major functions of safety committees and representatives.
- powers given to Occupational Health and Safety Inspectors
- housekeeping and potential hazards in relation to improper housekeeping
- selecting appropriate personal protective equipment (PPE) given hazardous situations

T14 The work environment encompassing:

- typical hazards associated with a range of work environments
- procedures used to control the risks associated with these hazards
- principles of risk assessment / management and state the purpose of each.
- hierarchy of OH&S hazard control measures.
- required documentation for risk assessment.
- commonly used workplace safety signs.
- workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
- appropriate fire extinguisher for a given type of fire.
- requirements for the location, mounting and maintenance of portable fire extinguishers.
- basic process of fighting a fire.
- safe premises, buildings and security are important in an industrial setting and the consequences of non- compliance with these.
- standard work procedure is and why they are required in some circumstances.

T15 Manual Handling encompassing:

- typical manual handling injuries and the effect they can have on lifestyle
- situations that may cause manual handling injuries
- correct procedures for lifting and carrying to prevent manual handling injuries
- Chemicals in the workplace encompassing:
- hazardous substances and dangerous goods.
- Classification of chemicals as hazardous substances and/or dangerous goods
- requirements for labelling of chemicals in the workplace
- safe storage procedures for chemicals
- purpose of and interpretation of material safety data sheet (MSDS)

T16 Working at heights encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- dangers associated with working on ladders and scaffolds
- identification of work area as a height risk and use appropriate safety equipment to prevent a fall
- selecting an appropriate ladder for a given situation and perform a safety check before use
- precautions that should be taken when ascending and working off a ladder
- precautions that should be taken when working on and around a scaffold and elevated platforms.

T17 Confined spaces encompassing:

- hazards associated with working in a confined space
- identifying workplace situations that could be classified as a confined space
- control measures for working in a designated confined space

T18 Physical and psychological hazards encompassing:

- short and long term effects of excessive noise and techniques to avoid damage to hearing due to excessive noise
- effects of vibration on the human body and work practices to protect against vibration
- effects of thermal stress on the human body and work practices to protect against thermal stress
- effects of ultraviolet (UV) radiation on the human body and work practices to protect against UV radiation.
- dangers associated with laser operated equipment and tools and suitable protective measures to overcome the danger.
- occupational overuse syndrome, state examples of how it occurs and describe means to overcome it
- factors that cause stress in the workplace, symptoms of a person suffering from stress and personal stress management techniques
- detrimental effects and dangers of drug and alcohol use in the workplace

T19 Working safely with electricity encompassing:

- effects of electric shock on the human body
- common causes of electrical accidents
- precautions that can minimise the chance of electric shock (earthing, extra low voltage, fuses, circuit breakers and residual current devices – RCDs)
- protection offered by a residual current device (RCD)
- need for ensuring the (safe) isolation of an electrical supply
- appropriate method of removing an electric shock victim from a live electrical situation

T20 Life support - CPR in the workplace encompassing:

- First Aid.
- responsibilities of the First Aider.

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REQUIRED SKILLS AND KNOWLEDGE

- priorities of first aid management for any accident or injury.
- procedures required at an accident scene.
- legal and ethical issues, which may impact on the management of care.
- 'Duty of Care'.
- examination of a casualty for injuries.
- effect of cardio pulmonary arrest on the body.
- Managing simulated conditions of: airway obstruction; respiratory arrest and cardio pulmonary arrest,
- single and two-person cardio pulmonary resuscitation (CPR).
- signs and symptoms of an altered level of consciousness
- management of simulation of a casualty with an altered level of consciousness.
- signs and symptoms of shock.
- management of simulation of a casualty in shock

T21 Risk management and assessment of risk encompassing:

- Principle and purpose of risk management, and
- Processes for conducting a risk assessment

T22 Hazards associated with low-voltage, extra-low voltage and high-currents encompassing:

- Parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage,
- Parts of an electronic systems and equipment where high-currents are likely.

T23 Risks and control measures associated with high-voltage encompassing:

- Parts of an electronic systems and equipment that operate at high-voltage,
- The terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and
- Control measures used for dealing with the hazards of high-voltage.

T24 Risks and control measures associated with low voltage encompassing:

- Risks associated with installation, fault finding, maintenance and repair.
- Control measures before, while and after working on electronic systems or equipment
- Isolation and tagging-off procedures.
- Risks and restrictions in working live.
- Control measures for working live.

T25 Risks and control measures associated with the high levels of radiation encompassing:

- RF hazards
- Maximum exposure levels to RF
- Maximum exposure to microwave radiation

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REQUIRED SKILLS AND KNOWLEDGE

T26 Optical fibre safety encompassing:

- Coherent optical sources and joining procedures
- Laser safety class 3a devices or their replace

T27 Safety, selection, use, maintenance and care of test equipment encompassing:

- Safety characteristics of electrical testing devices,
- Chemical cleaning solvents, glues and joining wastes used in electronics,
- Safe use of electrical testing device, and
- Checks and storage methods for maintaining the safety of testing devices.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

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  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and develop electronics/computer systems projects as described in 8) and including:

  a. Developing outlines of alternative designs.

  b. Developing the design within the safety and functional requirements and budget limitations.

  c. Constructing and testing prototype hardware and/or software according to design brief and regulatory requirements.

  d. Documenting and presenting design effectively.

  e. Successfully negotiating design alteration requests.

  f. Obtaining approval for final design.

  g. Verifying compliance of the design against the final brief.

  h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

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Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing and developing electronics/computer systems projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing and developing a medium sized electronics/computer systems project (see Note1), which involves design, modifications, installation, and/or maintenance of systems and equipment.

Note1:

Medium sized electronics/computer systems projects are those which would be recognised by a representative peer group of industry experts as medium sized within the norm customs and practices of the industry.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics/Computer Systems

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UEENEEH189A Provide Gate Array solutions for complex electronics systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers design and development of electronic systems using gate array technology. It encompasses working safely, following design briefs and applying knowledge of gate arrays and interpreting device specifications, constructing prototypes, using appropriate development software, applying programming techniques, testing developed system prototype operation, verifying compliance of the design against the final brief and documenting design and development work.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It is intended to apply to any formal recognition for this standard at the aligned AQF 5 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practise in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and, where applicable, contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design and develop advanced gate array systems	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Operational safety procedures for a given work area are obtained and understood
	1.3	The extent of the proposed gate array system design and development is determined from the design brief or in consultation with appropriate person(s).
	1.4	Design and development work is planned to meet scheduled timelines in consultation with others involved on the work site.
	1.5	Materials and devices/components required for the work are selected on compatibility of their specifications with system requirements and project budget constraints.
	1.6	Tools, equipment, software and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Design and develop advanced gate array systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of gate array devices, gate array systems and compliance standards are applied to the design.
	2.3	Alternative arrangements for the design and development are considered based on the

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ELEMENT	PERFORMANCE CRITERIA	
		requirements outlined in the design brief.
	2.4	Safety, functional and budget considerations are incorporated in the design.
	2.5	Prototype devices and circuits are constructed and tested for compliance with the design brief and regulatory requirements.
	2.6	Prototype malfunctions are rectified and retested to ensure effective operation with the design.
	2.7	Gate array system design and development is documented for submission to appropriate person(s) for approval.
	2.8	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for the design and development of advanced gate array systems and document	3.1	Gate array system design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for design modifications are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design and development is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing gate array systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH189A Gate Array fundamentals

Evidence shall show an understanding of gate array fundamentals to an extent indicated by the following aspects:

T1 Introduction to PLDs encompassing:

- Types of programmable logic devices.
- Features of CPLD devices
- Features of FPGA devices.
- Input /Output Logic family assignment for FPGA.

T2 Hardware Design language encompassing:

- Create a HDL design (using Verilog, VHDL or similar).
- Create a State machine design using CAD tools.
- Create instants of components, then interconnect the design using HDL.
- Interfacing to a FPGA using the JTag connection
- Program a FPGA in a currently working system with predetermined designs.

T3 Design Project encompassing:

- Use simulation tools to test each aspect of the design.
- Timing constraints, analysis, and hazards.
- Design implementation.
- Present documentation for a FPGA

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design Gate Array systems as described in 8) and including:

  a. Developing outlines of alternative designs and comparing advantages and disadvantages on each.

  b. Developing the design within the safety and functional requirements and budget limitations.

  c. Constructing and testing prototype devices and circuits according to design brief and regulatory requirements

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d. Documenting and presenting design effectively
e. Successfully negotiating design alteration requests.
f. Obtaining approval for final design.
g. Verifying compliance of the design against the final brief
h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- • OHS policy and work procedures and instructions.
- • Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing and developing gate array systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing and developing a gate array system, which controls at least three I/O devices or functions.

Note:

Examples may include: Security alarm system, Temperature control system, Data/information storage and retrieval system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Electronics

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UEENEEH190A Provide engineering solutions to air traffic control system problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers providing solutions to resolve problems in air traffic control systems. The unit encompasses safe working practices, interpreting diagrams, applying knowledge of air traffic control systems and their application, using effective problem solving techniques, safety and reporting work activities and outcomes.

Note.

Typical systems could be Air Traffic Management (ATM), Voice Switching and Control (VSCS), Data and Communications Networks, Aeronautical Fixed Telecommunications Network (AFTN), Control Maintenance Monitoring (CMM), Operational Display Suite (ODS), Air Situation Display (ASD), Tower Situational Awareness Display (TSAD), Aeronautical Reference Data Display and Distribution System (ARDDDS), back up to the above systems, Buildings & Services and Navigational Aids.

Application of the Unit

Application of the Unit

2)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

License to practice **3)**

CASA certification on a relevant facility or a class of facility.

Other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as traineeship.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

The skills and knowledge described in this unit may require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide solutions in air traffic control systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Operational safety procedures for a given work

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ELEMENT	PERFORMANCE CRITERIA	
		area are obtained and understood
	1.3	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.4	The extent of problems within the air traffic control system are determined from performance specifications and situation reports and in consultations with relevant persons.
	1.5	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Provide solutions to problems within air traffic control systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of air traffic control systems operation, characteristics and applications are applied to developing solutions to control problems.
	2.3	Parameters, specifications and performance requirements in relation to air traffic control systems problem are obtained in accordance with established procedures.
	2.4	Approaches to resolving air traffic control systems problems are evaluated to provide most effective solutions.
	2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.6	Problems are solved efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Test and document solutions to problems within air traffic control systems	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Solutions to air traffic control systems problems are tested to determine their effectiveness and modified where necessary.
	3.3	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.
	3.4	Justification for solutions used to solve air traffic control system problems are documented in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing solutions to air traffic control systems problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH190A Air traffic control systems technology

Evidence shall show an understanding of air traffic control systems technology to an extent indicated by the following aspects:

T1 Regulatory bodies encompassing:

- structure and function of each of the regulatory bodies

International Civil Aviation Organisation – ICAO

Australian Transport Safety Bureau – ATSB

Civil Aviation Safety Authority – CASA

- standards and recommended practices issued by the regulatory bodies
- relationship between the regulatory bodies and a provider of Air Traffic Services

T2 Air traffic services encompassing:

- services provided by Air Traffic Services
- objectives of Air Traffic Services

T3 Air traffic control awareness encompassing:

- process of maintaining an orderly flow of air traffic
- different states of an aircraft flight
- need and purpose of flight data regions
- enroute airspace and sectors
- airspace and sectors around air traffic control facilities
- instructions and information exchanged between controllers and pilots
- information exchanged between air traffic controllers

T4 The components of an air traffic control system encompassing:

- Air Traffic Management (ATM), Voice Switching and Control (VSCS), Data and Communications Networks, Aeronautical Telecommunications Network (AFTN),

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REQUIRED SKILLS AND KNOWLEDGE

Control Maintenance Monitoring (CMM), Buildings & Services

- purpose and function of each of the components of an air traffic control system

T5 Inputs to the air traffic management system (ATM) encompassing:

- messages and information received by the ATM system such as surveillance, time, metrological, flight plans and controller input

T6 Air traffic management (ATM) system architecture encompassing:

- the various Hardware Configuration Items (HWCI)
- operating system and other layers of software installed on the ATM system
- basic block diagram of the ATM system indicating the network topology, data processing subsystem and data presentation processing
- requirement for redundancy and the master / slave relationship
- the different partitions, connections and dependencies within the ATM system
- functions that can be performed from the Control Maintenance and Monitoring work station

T7 Outputs from the Air Traffic Management (ATM) system encompassing:

- the Operation Display Suites (ODS) and positions where they are used
- block diagram of the display suites indicating peripherals and connections
- different aircraft tracks generated by the ATM system
- other information shown on an Air Situation Display (ASD)
- requirement for and use of the recording and playback facility
- block diagram of the recording and playback facilities showing media devices and connections to the replay position
- requirement for and use of the trace collection facility
- block diagram of the trace collection facility showing media devices
- data and information provided to other systems by the ATM system

T8 The fallback system for ATM encompassing:

- purpose of the Ultimate Fallback (UFB) system
- block diagram of UFB indicating peripherals and connections
- operating system and application software installed on the UFB computers
- information used by UFB
- how the information is presented to the air traffic controllers
- actions required by an air traffic controller to access UFB system

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REQUIRED SKILLS AND KNOWLEDGE

T9 Voice switching and control System (VSCS) encompassing:

- purpose of the Voice Switching and Control System (VSCS)
- top level block diagram of the VSCS
- top level operation and protocols used by the VSCS
- various VSCS interfaces and functionality they provide
- basic operation of an air to ground communication facility
- need for and basic operation of air ground retransmission
- requirement for and use of the audio recording and replay facility
- block diagram of the audio recording and replay facilities showing the media access devices and connection to the VSCS
- functionality provided by the System Management System (SMS)

T10 Fallback for the voice switching and control system (VSCS) encompassing:

- purpose and functionality provided by the Air Ground Air (AGA) Bypass facility
- purpose and functionality provided by the Ground Ground (GG) Bypass facility
- block diagram of the VSCS and AGA Bypass connections
- block diagram of the VSCS and GG Bypass connections
- how an air traffic controller would access the AGA or GG Bypass facility if required

T11 Data and communication networks encompassing:

- purpose and primary use of the networks used by the air traffic control system
- systems and end users of each of the networks
- block diagram to show the high level architecture of each of the networks
- function of the networking devices used by the networks
- technologies and protocols used by the networks

T12 Aeronautical Fixed Telecommunications Network (AFTN) encompassing:

- function of the AFTN
- structure and type of message carried by the traditional AFTN
- type of messages that can be distributed by more contemporary message systems
- services provided by contemporary message systems
- basic block diagram of a contemporary message system

T13 Buildings and services encompassing:

- building layout and format of an air traffic control centre
- building layout and format of an air traffic control tower

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REQUIRED SKILLS AND KNOWLEDGE

- services required to support an air traffic control centre
- block diagram of the air traffic control centre electrical power system including main power, standby generator, UPS, batteries, switching equipment
- block diagram of the air traffic control centre airconditioning system including the major components and the primary and secondary loops
- basic flow chart to show the interaction between the fire system and other services in the air traffic control centre
- physical security requirements of an air traffic control centre
- components and operation of the security system used in an air traffic control centre

T14 Tower situational awareness display (TSAD) encompassing:

- need for and functionality provided by the Tower Situational Awareness Display (TSAD) System
- block diagram of a TSAD installation
- the source of and the information used by the TSAD system
- operating system and application software installed on the TSAD computers

T15 Aeronautical Reference Data Display and Distribution System (ARDDDS) encompassing:

- functionality provided by ARDDDS
- block diagram of an ARDDDS installation
- information used by the ARDDDS
- operating system and application software installed on the ARDDDS computers

T16 Navigational aids encompassing:

- purpose and functionality provided the navigational aids
- location of navigational aids
- basic principle of operation of the navigational aids

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide solutions to air traffic control systems problems as described in 8) and including:

  a. Understanding the extent of the air traffic control system problem.

  b. Obtaining air traffic control systems specifications and performance requirements appropriate to each problem.

  c. Testing and solutions to air traffic control system problems.

  d. Documenting justification of solutions implemented in

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accordance with established procedures.

e. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing solutions to air traffic control systems problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

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that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to providing solutions to at least four air traffic control system problems.

Systems problems could cover Air Traffic Management (ATM), Voice Switching and Control (VSCS), Data and Communications Networks, Aeronautical Fixed Telecommunications Network (AFTN), Control Maintenance Monitoring (CMM), Operational Display Suite (ODS), Air Situation Display (ASD), Tower Situational Awareness Display (TSAD), Aeronautical Reference Data Display and Distribution System (ARDDDS), backup to the above systems, Buildings & Services and Navigational Aids.

Note.

Typical air traffic control systems problems are those encountered in meeting performance requirements and compliance standards, revising control operating parameters and dealing with systems malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH191A Diagnose and rectify faults in air navigation circuits and systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding, repairing of faults and commissioning of air navigation systems. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical diagnostic methods and knowledge of navigation system components, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as traineeship.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

The skills and knowledge described in this unit may require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH127A	Set up and adjust commercial radio frequency (RF) transmission and reception systems
UEENEEH172A	Troubleshoot communication systems
UEENEEH190A	Provide engineering solutions to air traffic control system problems

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Operational safety procedures for a given work area are obtained and understood

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.4	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.5	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel.
	1.6	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.7	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose navigation system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Faults in the electronic components of the system are rectified to raise navigation system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Commissioning of navigational systems	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular air navigational system.
	3.3	Measuring instruments are set up and adjusted in accordance with transmission/reception requirements and equipment manufacturer's instructions.
	3.4	Adjustments are made to provide optimum transmission/reception performance within regulatory requirements.
	3.5	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	3.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	3.7	Setting-up is carried out efficiently without

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ELEMENT		PERFORMANCE CRITERIA	
			waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
4	Complete and report fault diagnosis and rectification activities	4.1	OHS work completion risk control measures and procedures are followed.
		4.2	Work site is made safe in accordance with established safety procedures.
		4.3	Rectification of faults is documented in accordance with established procedures.
		4.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified and re commission

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing, rectifying faults and commissioning air navigation systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH191A Electronic communications - air navigation systems

Evidence shall show an understanding of electronic communications - air navigation systems to an extent indicated by the following aspects:

T1 Aviation navigation services and principles encompassing:

- role of navigation aids in providing Air Traffic Control Services.
- functions provided by navigational aids
- Rho Theta concept in context of navigational aids used within aviation.
- relevant ICAO (Annex 10) specifications
- Monitoring – equipment, status and pilot

T2 Principle of operation of the NDB encompassing:

- simple block diagram of an NDB
- frequency band of operation
- parameters ICAO requires to be monitored
- typical radiation hazard issues
- simple block diagram of the aircraft Automatic Direction Finding (ADF) display
- NDB is used by Pilots and ATC

T3 Principle of operation of the CVOR/DVOR encompassing:

- simple block diagram of a CVOR labelling each part.
- basic principles of variable and reference information
- RF phasing and far field space modulation
- frequency band of operation.
- features of a typical aircraft display
- possible errors and their cause in a CVOR.
- typical CVOR and DVOR facilities.
- main differences of operation between CVOR and DVOR.

T4 Principle of operation of the DME encompassing:

- simple block diagram of a DME
- typical timing diagram from interrogation to reply.
- features of aircraft display system

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REQUIRED SKILLS AND KNOWLEDGE

- frequency band of operation
- modes of operation.

T5 Principle of operation of the ILS

- frequency band of operation
- simple diagram of the localiser antenna pattern marking on it the zero DDM line, the represented colour and modulating frequency of each lobe and the clearance signal.
- simple sketch showing the glide path and the location of the marker beacons listing their identification, frequency and duration.
- simple block diagram to show the generation of the Carrier and Sidebands and Sideband only signals.
- ILS antenna arrays and farfield radiation patterns
- Far field phasing and space modulation
- terms DDM, and SDM.
- performance requirements for CAT I, CAT II and CAT III ILS

T6 Principle of Global Navigation Satellite System (GNSS)

- basic principles of the Wide Area Differential Global Positioning System (WADGPS)
- basic principles of the Local Area Differential Global Positioning System (LADGPS)

T7 NDB Technology and Maintenance.

- key functional modules of a contemporary NDB transmitter.
- function of the aerial coupling unit.
- radiation hazard issues, site restrictions and safety considerations in context of an NDB facility.
- signals in and out of the main components
- key features and theory of operation of an NDB antenna (Field Pattern, Capacity hat and Ground Plane)
- hardware configurations of current models of NDB used in the National Airways System of Australia.
- indicators on NDB equipment that may be used to determine status and locate a fault
- method(s) for conducting routine performance measurements on NDB equipment.
- process for removing an NDB from service.
- correct test equipment based on measurement tolerance and parameter being measured.
- correct use of selected test equipment.
- process for returning the aid to service
- locate and identify appropriate NDB documentation (AEIs)
- Flight Check of an NDB is mandated.

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REQUIRED SKILLS AND KNOWLEDGE

T8 DME Technology and Maintenance.

- key functional modules of a contemporary DME beacon.
- modes of operation and relevant channel spacing for the Interrogation and Reply of the Beacon.
- purpose of the “squitter”.
- typical DME Block Diagram, the signal flow through the Beacon from incoming interrogation to outgoing Reply.
- function of each module in a contemporary DME.
- term “Gaussian Shaped Pulse” and why it is used.
- operation and purpose of the identification signal including test transmissions.
- define “Dead Time”
- monitored parameters of a DME.
- controls and indicators
- correct ON/OFF sequence
- process for removing a DME from service.
- auto-recycle operation
- typical function of the CTU for testing
- typical Alarm Registers
- measurement of parameters such as: Beacon Delay, Pulse Spacing, Pulse Width, Ident, Beacon Sensitivity, Selectivity, Reply Rate, Dead Time, Frequency, Monitor limits, Antenna VSWR, using the correct test equipment.
- correct use of test equipment.
- correlate the measurements to the Standard Operating Conditions (SOC)
- maintenance actions that may be performed without the requirements of a flight inspection
- Flight Calibration Check of an DME is mandated.
- process for returning the aid to service
- locate and identify appropriate DME documentation (AEIs)

T9 CVOR Technology and Maintenance.

- principles of operation of a VOR and how the component signals are generated in a contemporary CVOR beacon.
- basic operation and functionality of the; Transmitter, Goniometer, Modulation Eliminator, Monitor, Antenna
- typical monitored parameters for a CVOR
- purpose of monitor bypass
- correct use of test equipment and interpretation of results, SOCs
- measurement of performance parameters using the correct test equipment.
- correct use of test equipment.
- correlate the measurements to the Standard Operating Conditions (SOC).
- maintenance actions that may be performed without the requirements of a flight

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REQUIRED SKILLS AND KNOWLEDGE

inspection

- maintenance actions that do require a flight inspection
- importance of beacon accuracy

T10 DVOR Technology and Maintenance.

- principles of operation of a DVOR and how the component signals are generated in a contemporary DVOR beacon.
- basic operation and functionality of the; modules used in the following sub systems; Carrier generation and modulation, Timing sequence generation, Sideband amplifier and modulator, Sideband antenna commutation, Monitor and Controller
- front panel indications under normal and fault conditions
- operation and functionality of the following circuits; Carrier amplifier and modulation (CGD, CPA, CDC, CMP), Timing signals generation (TSD), Reference phase generator (RPG), Antenna switching (ASD, ADS), Sideband generator (SGN, SMA, SCU), Control unit (CTU), Monitor unit (MRF, MSC, MFI, MBD, MSD).
- typical monitored parameters for a DVOR
- correct use of test equipment and interpretation of results, SOCs
- measurement of performance parameters using the correct test equipment
- correct use of test equipment.
- correlate the measurements to the Standard Operating Conditions (SOC).
- maintenance actions that may be performed without the requirements of a flight inspection
- maintenance actions that do require a flight inspection
- importance of beacon accuracy

T11 ILS Technology and Maintenance.

- ILS functional blocks and typical cabinet modules of a Localiser and Glide Path (NM7000 series).
- main functional elements of a contemporary marker beacon.
- location and function of modules and system interconnections; Transmitter, Changeover, Monitor, Transmitter controller, Remote control, RMS/RMM, Power
- block diagram illustrate at specified points, the signal flow out from the distribution side and/or return via the recombination side of a Localiser and/or Glide Path
- operation of a specified Localiser antenna array.
- operation of an ‘M’-Array or other specified Glide Path antenna array
- the features and function of the RMM and/or RMS.
- performance requirements for CAT I, CAT II and CAT III ILS and how these are provisioned in the system hardware and monitoring.
- function of equipment indicators and controls, including the correct operation of controls to achieve a nominated function

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REQUIRED SKILLS AND KNOWLEDGE

- typical monitored parameters for a Localiser, Glide Path and Marker beacon
- correct use of test equipment (BITE and external) and interpretation of results, SOCs
- measurement of performance parameters using the correct test equipment.
- correct use of test equipment.
- correlate the measurements to the Standard Operating Conditions (SOC).
- maintenance actions that may be performed without the requirements of a flight inspection
- maintenance actions that do require a flight inspection
- typical tests and maintenance actions required during a flight calibration of an ILS

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in air navigation systems as described in 8) and including:

  a. Applying logical diagnostic methods.
  b. Using fault scenarios to test the source of system faults.
  c. Identifying faults and competency needed to rectify them.
  d. Rectifying faults in system electronics.
  e. Verifying that the system operates correctly.
  f. Documenting fault rectification.
  g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and

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replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in air navigation systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by diagnosing and rectifying at least four system faults across a representative range of electronic air navigation systems.

NDB, VOR, DME, ILS. GNSS

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEH192A Develop solutions for air surveillance apparatus and systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers development of engineering solutions for air surveillance apparatus and systems. The unit encompasses safe working practices, interpreting diagrams, applying logical engineering solution methods and knowledge of air surveillance apparatus and systems, safety and functional testing, and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as traineeship.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

The skills and knowledge described in this unit may require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH116A	Find and repair microwave amplifier section faults in electronic apparatus
UEENEEH172A	Troubleshoot communication systems
UEENEEH190A	Provide engineering solutions to air traffic control system problems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide engineering solutions	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Operational safety procedures for a given work area are obtained and understood
	1.3	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.4	Safety hazards that have not previously been identified are documented and risk control

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ELEMENT	PERFORMANCE CRITERIA	
		measures devised and implemented in consultation with appropriate personnel.
	1.5	The extent of problems is determined from reports and other documentation and from discussion with appropriate personnel.
	1.6	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.7	Tools, equipment and testing devices needed to provide engineering problems are obtained in accordance with established procedures and checked for correct operation and safety.
2 Provide engineering solutions	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Logical diagnostic methods are applied to provide engineering solutions to problems in air surveillance apparatus and systems employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected problems scenarios are tested as being the source of system problems.
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.
	2.7	Problems in the electronic components of the system are rectified to raise air surveillance and observation system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified

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ELEMENT	PERFORMANCE CRITERIA	
		requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report engineering solutions activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Engineering solutions for air surveillance apparatus and systems is documented in accordance with established procedures
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices, engineering solutions air surveillance and observation systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH192A Electronic communications air surveillance systems

Evidence shall show an understanding of electronic communications - air surveillance systems to an extent indicated by the following aspects:

T1 Basic Radar Principles encompassing:

- requirement of surveillance to support efficient, safe and effective ATC operations
- aircraft aspects
- basic radar history
- electromagnetic waves
- radiation hazards and OHS considerations
- radar principles of operation
- types of radar and radar block diagram
- main inputs and outputs for designated blocks of a given diagram
- requirement for redundancy
- go / nogo concept
- radar performance limitations
- different types of radar self testing
- surveillance- original environment, developing environment
- surveillance users
- radar locations and radar coverage map

T2 Principles of operation of a Primary Surveillance Radar (PSR) encompassing:

- purpose of a PSR
- principles of radar blind speed and measures to overcome this
- why radars use pulse compression and list the types of modulation used
- diversity operation is used in Primary radars
- radiation pattern for a ‘cosec2’ and slotted waveguide antenna
- radars use high / low coverage
- features of Primary radars currently in service

T3 Principles of operation of a Classical Secondary Surveillance Radar (SSR) encompassing:

- similarities and differences between PSR and SSR

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REQUIRED SKILLS AND KNOWLEDGE

- requirement to use wobbulation
- relevant ICAO (Annex 10) specifications
- modes of operation
- transponder special replies and their functions
- SSR radiation patterns
- reasons for “No Reply” from an aircraft
- define garbling
- define FRUIT
- function of a Site Monitor
- advantages and disadvantages of SSR over primary radar
- features of classical SSRs

T4 Principles of operation of a Mode S Secondary Surveillance Radar encompassing:

- improvements Mode S has over classical SSR
- ICAO requirements relating to the use of aircraft addresses and Interrogator Codes
- purposes of All-call and roll-call interrogations
- principles of acquiring aircraft
- users of Mode S Transponders quitter
- protocols used to reduce FRUIT
- principles of All-call Lockouts and Lockout Overrides
- requirement for Classical SSR and Mode S SSR compatibility
- benefits to a controller of using elementary and enhanced surveillance
- features of Mode S SSRs

T5 Principles of operation of Radar Track Processors encompassing:

- function of radar track processor currently in service

T6 Principles of operation of Radar RCMS

- requirement for radar RCMS
- Radar RCMS network layouts

T7 Principles of operation of ADS encompassing:

- principles of operation of ADS-B
- aircraft data transmitted by ADS-B
- aircraft ADS-B transmission rates
- principles of operation of ADS-C

T8 Principles of operation of Multilateration encompassing:

- introduction, definition and history of Multilateration
- TDOA concepts
- Airport / local area concept
- Airborne / wide area concept

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REQUIRED SKILLS AND KNOWLEDGE

- Data and identification
- Surveillance strategies
- MLAT coverage
- principles of operation of MLAT
- message formats used by MLAT systems
- similarities and differences between MLAT and ADS-B systems

T9 Principles of Surveillance Track Messages encompassing:

- requirement for duplicated data paths
- ATS Centre processing and displaying of surveillance tracks
- contents of data messages sent from radar sites
- contents of data messages sent from ADS-B radar sites

T10 Principles of ACAS/TCAS encompassing:

- purpose and types of ACAS/TCAS
- function of ACAS/TCAS
- how ACAS/TCAS acquires and tracks aircraft
- ICAO requirements with respect to complying with RAs

T11 Performance characteristics and checks encompassing:

- measurement of radar PRF
- measurement of radar pulse shape / timing check
- measurement of radar transmitter frequency
- performing radar spectrum check
- identification of radar performance with or outside documented performance limits

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide solutions in air surveillance apparatus and systems as described in 8) and including:

  a. Applying logical diagnostic methods.

  b. Using test equipment to test the apparatus and system

  c. Identifying problems and competency needed to provide solutions

  d. Implementation of solutions

  e. Verifying that the system operates correctly.

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f. Documenting engineering solutions.
g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing engineering solutions for air surveillance apparatus and systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

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that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by diagnosing and rectifying at least four engineering solutions in a representative range of electronic air surveillance and observation systems.

Primary Surveillance Radar (PSR)

Secondary Surveillance Radar (SSR)

Mode S Secondary Surveillance Radar

Radar Track Processors

Radar RCMS

ADS

Multilateration

Surveillance Track Messages

ACAS/TCAS

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEI101A Use instrumentation drawings, specification, standards and equipment manuals

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers using drawings, specifications, standards and equipment manual applicable to installing, maintaining and fault finding process controls. It encompasses the principles of process control embodied in drawings, standards, specifications and equipment manuals, matching equipment with that specified for a given function and location and determining the connections required between pneumatic, hydraulic and electrical equipment from instrumentation drawings and specifications

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical

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License to practice **3)**

work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace`
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 3 Writing 3 Numeracy 3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to use instrumentation drawings, specification, standards and equipment manuals.	1.1	Established OHS risk control measures and procedures are followed.
	1.2	The need for instrumentation drawings, specification, standards or equipment manuals is determined from the nature of the work to be undertaken.
	1.3	Established routines and procedures are followed to obtain instrumentation drawings, specification, standards or equipment manuals required for the work to be undertaken.

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ELEMENT	PERFORMANCE CRITERIA	
2 Use instrumentation drawings, specification, standards and equipment manuals	2.1	Instrumentation drawings, specification, standards and/or equipment manuals are selected, appropriate to the work being undertaken.
	2.2	Instrumentation drawings, specification, standards and equipment manuals are interpreted using knowledge of process controls and instrumentation drawing layouts, conventions and symbols.
	2.3	Dimensions are extracted from drawings and diagrams for application to work undertaken.
	2.4	Location of equipment is determined from instrumentation drawings and specification.
	2.5	Connections between pneumatic, hydraulic and electrical equipment are determined from instrumentation drawings and specifications
	2.6	Equipment manuals are reviewed to ascertain their format and where information relevant to the work to be undertaken is located.
	2.7	Information given in equipment manuals is interpreted in relation to the work to be undertaken.
3 Convey instrumentation information and ideas using drawings and diagrams.	3.1	Drawing conventions are used in neat freehand drawings to convey instrumentation information and ideas to others involved in the work to be undertaken.
	3.2	Instrumentation drawing conventions are used to neatly correct freehand original job drawing to show final ‘as-installed’ arrangement.
	3.3	Corrected drawings are forwarded to appropriate person(s) in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and using instrumentation drawings, specification, standards and equipment manuals.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI101A Concepts and Practices of Industrial Instrumentation

Evidence shall show an understanding of the concepts of industrial instrumentation and the basic practices to an extent indicated by the following aspects:

T1 Industrial Instrumentation encompassing:

- Introduction to the purposes of measurement in industrial processes
- Instrument control loops
- Types of measurement in these processes
- Local and remote measurement
- Measurement signal methods
- Signal transmissions electrical standards
- Signal transmissions pneumatic standards
- Flow, temperature, pressure and other appropriate measurements.
- Identification and purpose of instruments measuring processes directly and those measuring indirectly.
- Instrumentation and control components: sensors, transducers, converters and transmitters.

T2 Instrument Standards encompassing:

- Instrumentation standards
- Relationship between standards
- Using standards
- Fluids in Process Piping Colour Coding.
- Instruments symbols

T3 Instrumentation Terminology and SI units encompassing:

- SI base units
- SI derived units
- Scientific notation and engineering notation
- SI prefixes.
- Instrumentation metric units
- Non-standard SI Units - kg/cm2, etc.
- Conversion of units
- Instrumentation terminology:

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REQUIRED SKILLS AND KNOWLEDGE

- Span
- Range
- Accuracy
- Precision
- Errors
- Zero
- Repeatability
- Sensitivity
- Hysteresis

T4 Calibration of link and lever instruments encompassing:

- Principles of levers and links and calibration of indicator recorder instrument
- Calibration terms
- Calibrate a link and lever instrument
- Interpret calibration data so as to identify the types of error displayed by an instrument and whether the instrument is within its specified accuracy.
- Interpretation of graphs and tables associated with instrumentation

T5 Instrumentation safe working practices encompassing:

- Identification of instrumentation and control hazards
- Risk control measures for instrumentation work.
- Risk assessment

T6 Instrumentation drawings, diagrams and manuals encompassing:

- Electrotechnology drawing symbols for instrumentation and control (electrical/electronic circuits; Instrument circuits/diagrams; PLC diagrams; pneumatic; hydraulic)
- tandards used in Instrumentation drawings (ISA; ASME; AS; SAMA).
- Drawings used in Instrumentation - schematic; single line; wiring; PLC diagrams; process flow diagrams - brief instrument information; process loop diagrams - details, terminals, types of instruments.
- Manufacturers Data Sheets, Manuals, Specifications and Test Procedures - instrumentation Manuals, Catalogues and Drawings.
    - Interpretation of the specifications contained within instrumentation Manuals, Catalogues and Drawings.
    - Interpretation of the test procedures contained within instrumentation Manuals, Catalogues and Drawings.
    - Comparison of data presented in different forms for the same equipment.
    - Identification of data relevant to instrumentation from a range of publicity material.
    - Extraction of information such as calibration, testing or installation procedures from manuals, specification sheets and drawings.

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REQUIRED SKILLS AND KNOWLEDGE

- Quantity take-offs and Parts Lists
  - Part Numbers for components, assemblies and equipment.
  - Parts List for a specified project or installation from Manuals, Catalogues, Specifications and Drawings.
  - List of equipment, required to undertake a specified project or installation, from Manuals, Catalogues, Specifications and Drawings.
  - Identification and extraction of a Part Number for an actual sample component or part from a Manual, Catalogue, Specification and/or Drawing
- Sketching of instrumentation and control drawings:
  - Sketching a schematic circuit diagram from a given circuit board layout diagram, wiring or installation drawing and installation or modification of a specified project using information contained within Manuals,
  - Sketching a part or equipment layout needed to perform a specified task, such as installation or modification, from given Manuals, Catalogues, Specifications and Drawings

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and

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regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement

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- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use instrumentation drawings, specification, standards and equipment manuals as described in 8) and including:

A Identifying instrumentation drawings, specification, standards and equipment manuals relevant to the work to be undertaken.

B Interpreting instrumentation drawings, specification, standards and equipment manuals using knowledge of process controls and instrumentation drawing layouts, conventions and symbols.

C Determining location of equipment from instrumentation drawings and specification

D Determining connections between pneumatic, hydraulic and electrical equipment correctly

E Using correct conventions in freehand drawings.

F Giving correct information in freehand drawings.

G Dealing with unplanned event

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment

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environment.

Note: Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to instrumentation drawings, specification, standards and equipment manuals

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to instrumentation assembly, installation, fault finding, maintenance or development work functions using at instrumentation drawings, specification, standards and equipment manuals for least two different process control systems

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Instrumentation and Control

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UEENEEI102A Solve problems in pressure measurement components and systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers setting up pressure measuring components and systems and providing solutions to pressure measurement problems as they apply to various process and control work functions. It encompasses working safely, setting up and calibrating pressure measuring components and systems, problem solving techniques, the use of a range of measuring devices, providing solutions derived from measurements and calculations to predictable problems in pressure measurement components and systems.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. The unit may also be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the work place. However they are subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to work on pressure measurement components and systems	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control work preparation measures and procedures are followed.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	The nature of the pressure measurement problem is obtained from documentation or from an appropriate person to establish the scope of work to be undertaken.
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved or affected by the work.
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Solve pressure measurement problems	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure any electrical components live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Pressure measurement apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Established methods are used to solve measurement problems from tests and calculated values as they apply to pressure measurement components and systems
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person
		2.6	Problems are solved using sustainable energy principles and without damage to apparatus, the surrounding environment or services

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and document work activities	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with established procedures
	3.3	Written justification is made for solutions to pressure measurement problems
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in pressure measurement components and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI102A Pressure Measurement

Evidence shall show an understanding of pressure measurement used in industrial processes to an extent indicated by the following aspects:

T1 Pressure measurement terms and transducers encompassing:

- Purpose of pressure measurement
- Applications of pressure measurement
- Common terms and relationships
- Pressure and the relationship between applied pressure, density, mass, force, area and the height of liquid columns.
- Types and applications of pressure transducers
- Transducers input/outputs - Measurement and evaluation
- Transducer connections

T2 Manometers encompassing:

- Types of manometers
- Operating principles of manometers
- Gauge pressure measurement
- Wet leg
- Manometers applications
- Manometer limitations

T3 Absolute, gauge and atmospheric pressure measurement encompassing:

- Absolute and gauge pressure.
- Absolute zero pressure
- Atmospheric pressure
- Barometers
- Absolute pressure gauges

T4 Mechanical pressure measuring devices encompassing:

- Bourdon tube gauges
- Spiral and helical gauges
- Term: Flexibility spring rate
- Other mechanical pressure elements: bellows, capsule, slack/stiff diaphragms.

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REQUIRED SKILLS AND KNOWLEDGE

- Pressure measurement using elastic deformation gauges

T5 Electrical pressure measuring devices encompassing:

- Electrical sensors for pressure measurements: (capacitive, piezo, inductive, strain gauge).
- Operating principles of electrical pressure elements
- Testing elements
- Electrical signal transmission devices.

T6 Dead weight testers encompassing:

- Law of hydraulics
- Dead Weight Tester operating principles
- Dead Weight Tester operating procedures
- Terms: Backlash, hysterics, repeatability
- Calibration of gauges
- Precautions
- Bourdon tube gauges calibration

T7 Testing and installation of pressure measurement devices encompassing:

- Testing
- Calibration
- Installation of pressure measurement devices within pressure vessel systems.
- Isolation, seal, vent, drain and bypass valves location and operation sequence.

T8 Pressure transmitters and converters encompassing:

- Principle of operation of moment, motion and forced balanced transmitters for pneumatic, electrical, and electronic transmitters.
- Applications of transmitters
- Transmitter connections
- Manufacturer’s manuals
- Calibration of transmitters
- Principle of operation of signal convertors
- Applications of pressure converters
- Calibration of pressure converters

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in pressure measurement systems as described in 8) and including:

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A	Determining the operating parameters of a pressure measuring system
B	Setting up and calibrating a pressure measuring system
C	Altering an existing pressure measuring system to comply with specified operating parameters
D	Developing a pressure measuring system to comply with a specified function and operating parameters
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in pressure measurement systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI107A	Install instrumentation and control cabling and tubing

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to pressure measurement apparatus and systems as they apply to chemical, industrial or medical processes associated with installation, fault finding, maintenance or development work functions, and at least three of the following types of pressure measurement problems on at least two occasions:

- Determining the operating parameters of a pressure measuring system•
- Setting up and calibrating a pressure measuring system
- Altering an existing pressure measuring system to comply with specified operating parameters
- Developing a pressure measuring system to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI103A Solve problems in density/level measurement components and systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers setting up density/level measuring components and systems and providing solutions to density/level measurement problems as they apply to various process and control work functions. It encompasses working safely, setting up and calibrating density/level measuring components and systems, problem solving techniques, the use of a range of measuring devices, providing solutions derived from measurements and calculations to predictable problems in density/level measurement components and systems.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. The unit may also be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the work place. However they are subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to work on density/level measurement components and systems	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control work preparation measures and procedures are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	The nature of the density/level measurement problem is obtained from documentation or from an appropriate person to establish the scope of work to be undertaken.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved or affected by the work.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Solve density/level measurement problems	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure any electrical components live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Density/level measurement apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Established methods are used to solve measurement problems from tests and calculated values as they apply to density/level measurement systems.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved using sustainable energy principles and without damage to apparatus, the surrounding environment or services.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and document work activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Written justification is made for solutions to density/level measurement problems.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in density/level measurement systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI103A Level/Density Measurement

Evidence shall show an understanding of level/density measurement used in industrial processes to an extent indicated by the following aspects:

T1 Introduction to level/density measurement encompassing:

- Definitions density and relative density (sg)
- Application
- Factors affecting density
- Density measurement
- Archimedes' Principle
- Density calculations
- Types and applications of level/density transducers
- Transducers input/outputs - measurement and evaluation
- Transducer connections

T2 Level measurement techniques – sight type encompassing:

- Dipstick and hook gauges
- Tubular and flat glass gauges
- Accuracy of flat glass gauges
- Magnetically coupled gauges
- Float Level Measuring devices
- Application of float devices

T3 Level/density measurement - force type techniques encompassing:

- Comparison of float and displacement type systems
- Interface sensing devices
- Torque tube type displacer operation
- Torque tube type displacer construction
- Pneumatic and electronic transmitters

T4 Level/density measurement - pressure-type techniques encompassing:

- Diaphragm level detectors
- Applications of diaphragm level detectors
- Differential pressure cells advantages and disadvantages

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REQUIRED SKILLS AND KNOWLEDGE

- Density measurement using D/P cells

T5 Level/density measurement - electrical techniques encompassing:

- Application of conductance probes
- Operation of a conductivity-level controller
- Resistance tapes level detectors
- Capacitance probes level detectors
- Ultrasonic level detectors
- Microwave-based level detectors
- Nucleonic-type level sensors
- Load Cells used for level measurement

T6 Level/density measurement - non-intrusive type techniques encompassing:

- Radiation-type density sensor
- Hydrometer element used for density measurement
- Vibrating tube type liquid density meter

T7 Level/density measurement calibration encompassing:

- D/P cell calculations
- D/P cell calibration
- Open Tank installation level measurement.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace

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procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in density/level measurement systems as described in 8) and including:

A	Determining the operating parameters of a density/level measuring system
B	Setting up and calibrating a density/level measuring system
C	Altering an existing density/level measuring system to comply with specified operating parameters
D	Developing a density/level measuring system to comply with a specified function and operating parameters
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment **9.3)**

This unit must be assessed as it relates to normal work practice

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using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in density/level measurement systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

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UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to the density/level measurement apparatus and systems as they apply to chemical, industrial or medical processes associated with installation, fault finding, maintenance or development work functions, and at least three of the following types density/level measurement problems on at least two occasions:

- Determining the operating parameters of a density/level measuring system
- Setting up and calibrating density/level measuring system
- Altering an existing density/level measuring system to comply with specified operating parameters
- Developing a density/level measuring system to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI104A Solve problems in flow measurement components and systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers setting up flow measuring components and systems and providing solutions to flow measurement problems as they apply to various process and control work functions. It encompasses working safely, setting up and calibrating flow measuring systems, problem solving techniques, the use of a range of measuring devices, providing solutions derived from measurements and calculations to predictable problems in flow measurement systems.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. The unit may also be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the work place. However they are subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on flow measurement components and systems	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	The nature of the flow measurement problem is obtained from documentation or from an appropriate person to establish the scope of work to be undertaken.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved or affected by the work.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Solve flow measurement problems	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure any electrical components live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Flow measurement apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Established methods are used to solve measurement problems from tests and calculated values as they apply to flow measurement systems.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved using sustainable energy principles and without damage to apparatus, the surrounding environment or services.
3 Complete work and document work activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Written justification is made for solutions to flow measurement problems.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in flow measurement systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI104A Fluid flow measurement principles

Evidence shall show an understanding of fluid flow measurement used in industrial processes to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Introduction to flow measurement in closed conduits encompassing:

- Basic principles of fluid flow
- SI units pertaining to flow and conversion factors to SI units.
- Volumetric and mass flow
- Reynolds numbers
- Behaviour of fluid flow in pipes
- Correction methods
- Flow terminology
- Pressure loss
- Integration
- Uses of flow meters
- Types and applications of flow transducers
- Transducers input/outputs - Measurement and evaluation
- Transducer connections

T2 Differential pressure flow measurement encompassing:

- Bernoullis theorem
- Calculations of the differential pressure
- Calibration of the associated secondary instrument.
- Square-root head law
- Types of differential pressure flow meters.
- Types of differential pressure flow primary elements
- Installation of differential pressure flow primary elements

T3 Differential pressure flow measurement circuits encompassing:

- Define turndown and accuracy
- Output signals
- Square root extractors
- Scaling factors
- Signal scaling

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REQUIRED SKILLS AND KNOWLEDGE

T4 Variable area flow meters and turbine flow meters encompassing:

- Operating principles of variable area flow meters
- Density correction calculations
- Variable area meters performance factors
- Applications of variable area meters
- Installation of variable area meters
- Operating principles of turbine meters
- Scaling factors
- Performance of turbine meters.
- Application of turbine meters
- Installation of turbine meters

T5 Electromagnetic, vortex and ultrasonic flow meters encompassing:

- Operating principles of electromagnetic flow meters
- Construction of electromagnetic flow meters
- Performance of electromagnetic flow meters.
- Applications of electromagnetic flow meters
- Installation of electromagnetic flow meters
- Operating principles of vortex flow meters
- Operating principles and applications of ultrasonic flow meters
- Installation of vortex and ultrasonic flow meters

T6 Mass flow measurement and volumetric flow rate correction encompassing:

- Volumetric flow rate correction
- Calculations of corrected flow rate
- Calibration of corrected systems components
- Mass flow measurement
- Operating principles of mass flow meters
- Performance of mass flow meters.
- Applications of mass flow meters
- Installation of mass flow meters

T7 Mechanical flowmeters for liquid service encompassing:

- Operating principles of mechanical flow meters
- Performance of mechanical flow meters
- Applications of mechanical flow meters
- Installation of mechanical flow meters

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REQUIRED SKILLS AND KNOWLEDGE

- Operating principles of gas flow meters
- Performance of gas flow meters
- Applications of gas flow meters
- Installation of gas flow meters

T8 Open-channel flow measurement and flow meter calibration encompassing:

- Principles of fluid flow in open channels
- Principles of head/flow relationships
- Non-linear head/flow relationships
- Calculations of the head generated
- Operating principles of secondary instruments
- Open channel flow measurement
- Installation of open channel flow meters
- Flow meter calibration

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the

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workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in flow measurement systems as listed as described in 8) and including:

A Determining the operating parameters of a flow measuring system

B Setting up and calibrating a flow measuring system

C Altering an existing flow measuring system to

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	comply with specified operating parameters
D	Developing a flow measuring system to comply with a specified function and operating parameters
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in flow measurement systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3

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'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to the flow measurement apparatus and systems as they apply to chemical, industrial or medical processes associated with installation, fault finding, maintenance or development work functions, and, and at least three of the following types flow measurement problems on at least two occasions:

- Determining the operating parameters of a flow measuring system
- Setting up and calibrating a flow measuring system
- Altering an existing flow measuring system to comply with specified operating parameters
- Developing a flow measuring system to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI105A Solve problems in temperature measurement components and systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers setting up temperature measuring components and systems and providing solutions to temperature measurement problems as they apply to various process and control work functions. It encompasses working safely, setting up and calibrating temperature measuring components and systems, problem solving techniques, the use of a range of measuring devices, providing solutions derived from measurements and calculations to predictable problems in temperature measurement components and systems.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. The unit may also be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the work place. However they are subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on temperature measurement components and systems	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	The nature of the temperature measurement problem is obtained from documentation or from an appropriate person to establish the scope of work to be undertaken.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved or affected by the work.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Solve temperature measurement problems	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure any electrical components live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Temperature measurement apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Established methods are used to solve measurement problems from tests and calculated values as they apply to flow measurement components and systems.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved using sustainable energy principles and without damage to apparatus, the surrounding environment or services.
3 Complete work and document work activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in

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ELEMENT	PERFORMANCE CRITERIA	
		accordance with established procedures.
	3.3	Written justification is made for solutions to flow measurement problems.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in temperature measurement components and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI105A **Temperature measurement principles**

Evidence shall show an understanding temperature measurement used in industrial processes to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Introduction to Temperature Measurement encompassing:

- Temperature measurement terms
- International Temperature Scale
- Temperature scales
- Conversion of temperature readings
- Temperature measuring elements
- Temperature sensor selection factors
- Errors in temperature measurement
- Methods used to reduce errors.
- Types and applications of temperature transducers
- Transducers input/outputs - Measurement and evaluation
- Transducer connections

T2 Resistance Temperature Detectors (RTDs) encompassing:

- Selection of RTDs
- RTD terms
- Determining RTD standard resistance values
- Calculating RTD resistance or temperature
- Selecting RTD configurations
- Using Australian Standards for RTDs

T3 RTD Measuring Circuits encompassing:

- RTD unbalanced Wheatstone bridge circuits
- Calculations of unbalanced Wheatstone bridge circuits voltage outputs
- Non-linear voltage output compensation methods
- Calculations of RTD resistance in Wheatstone bridge circuits
- RTD lead resistance errors
- Compensation method of lead resistance errors
- RTD immersion error

T4 Thermocouples encompassing:

- Thermo-electric effects principles
- Thermocouple thermo electric laws
- Determining thermocouple measuring junction temperature
- EMF distribution in thermocouple circuits
- Calibration of thermocouple measuring instruments
- Characteristics of thermocouples
- Advantages and disadvantages of thermocouples

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REQUIRED SKILLS AND KNOWLEDGE

T5 Thermocouple Measuring Circuits encompassing:

- Characteristics of thermocouple connection wires
- Identification of thermocouple connection wires
- Thermocouple measuring junction configurations
- Industrial thermocouple assembly
- Thermowell properties
- Thermocouple fabrication methods
- Handling of thermocouples
- Thermocouple test equipment
- Thermocouple selection
- Thermocouple installation errors

T6 Filled System Thermometers encompassing:

- Liquid in glass thermometers construction
- Filled systems operating principles
- Applications of filled system thermometers.
- Calibration of filled systems

T7 Radiation Thermometers encompassing:

- Radiation pyrometer terms
- Operating principles of radiation thermometers.
- Operating principle of radiation pyrometer measurement
- Construction of optical pyrometers and radiation thermometers.
- Signal conditioning
- Factors affecting the use of radiation thermometers
- Calibration of optical pyrometers and radiation thermometers.

T8 Other Temperature Measuring Techniques encompassing:

- Thermistor characteristics
- Thermistor temperature measuring circuits operation
- Thermistor digital thermometer
- Temperature measurement solid state devices characteristics
- Temperature measurement solid state devices circuits
- Temperature indicators characteristics
- Temperature indicators applications
- Liquid crystals
- Bimetallic thermometers

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in temperature measurement systems as listed as described in 8) and including:

A	Determining the operating parameters of a temperature measuring system
B	Setting up and calibrating a temperature measuring system
C	Altering an existing temperature measuring system

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	to comply with specified operating parameters
D	Developing a temperature measuring system to comply with a specified function and operating parameters
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in temperature measurement systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to temperature measurement apparatus and systems as they apply to chemical, industrial or medical processes associated with installation, fault finding, maintenance or development work functions, and, and at least three of the following types temperature measurement problems on at least two occasions:

- Determining the operating parameters of a temperature measuring system
- Setting up and calibrating a temperature measuring system
- Altering an existing temperature measuring system to comply with specified operating parameters
- Developing a temperature measuring system to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI106A Set up and adjust PID control loops

Modification History

Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers providing solutions to predictable problems in process control loops. It encompasses working safely, applying logical problem solving procedures, evaluating performance, the use of measuring devices, providing solutions to predictable control problems, and documenting solutions.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

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Prerequisite Unit(s) **4)**

UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems

Electrical Pathway Group

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Instrumentation and Control Pathway Group

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability

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Employability Skills	**5)** Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on process control loops	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed
	1.3	The nature of the control problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Solve process control loops problems	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and

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ELEMENT	PERFORMANCE CRITERIA	
		when necessary conducted within established safety procedures
	2.3	Process controller/transmitters/converters and control loops are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Known solutions that include the use of measured and calculated values are used for solving predictable process control loops problems.
	2.5	Written justification is made for solutions used to solve process control loops problems.
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.7	Problems are solved without damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Complete work and provide status report(s)	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Status report(s) is/are completed and work supervisor notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in process control loops.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI106A **Process control loops principles**

Evidence shall show an understanding of process control principles and systems to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Introduction to control systems encompassing:

- Control loop components
- Purpose of control loop components
- Open and closed loop control
- Control loop block diagram
- Direct acting and reverse acting controllers.

T2 Process control terminology encompassing:

- Process control terms
- Conversion of gain and % proportional band
- Process controller features

T3 Process characteristics encompassing:

- Process control static characteristics
- Process control characteristic terminology
- Effects of change on process control systems
- process characteristics: , resistive lag, capacitive, dead-time, on/off control, proportional control – amplitude – time, proportional plus integral control, proportional plus integral plus derivative control.

T4 Types of control and control modes encompassing:

- Types of control modes
- Effects of set point/process demand changes
- Repeat/minute
- Integral time
- Changing integral time
- Resistance/capacitance networks
- Derivative time
- Reset wind-up

T5 Connection of controllers encompassing:

- Control loop power requirements
- Control loop inputs and outputs
- Instrument connections
- Connecting control loops

T6 Testing of control modes encompassing:

- Process controller adjustments
- Process control test equipment

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REQUIRED SKILLS AND KNOWLEDGE

- Bench testing procedures
- Bench test connections
- Bench testing process controllers

T7 Process controllers encompassing:

- PID functions
- Applications of PID modes of control
- Applications of controller options
- Checking/adjustment of controllers
- Reset windup

T8 Tuning and installation of control loops encompassing:

- Application of control valves
- Control valve characteristics
- Installation and commissioning control loops
- Tuning control loops
- Microprocessor controller tuning

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency

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in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices & workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in process control loops as listed as described in 8) and including:

A	Determine the operating parameters of a controller in an existing control loop.
B	Configure/and tune a controller in an existing control loop to comply with specified operating parameters.
C	Configure/and tune a controller to comply with a specified function
D	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in process control loops.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104	Solve problems in flow measurement components

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A	and systems
UEENEEI105 A	Solve problems in temperature measurement components and systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to a hydraulic or pneumatic controller and a microprocessor-based controller and solving at least two of the following problems:

- Determining the operating parameters of a controller, in an existing control loop
- Configuring/tuning a controller in an existing control loop to comply with specified operating parameters
- Configuring/tuning a controller to comply with a specified function

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI107A Install instrumentation and control cabling and tubing

Modification History

		UEENEEI107A	Install instrumentation and control cabling and tubing	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete "For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2".	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the installation and termination of instrument and control cabling and tubing for chemical, industrial or food processing systems or equipment used in medical procedures. It encompasses working safely and to standards, routing cables and tubing to specified locations, terminating cables and tubing and connecting wiring at accessories and at instruments and control apparatus and completing the necessary installation documentation.

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Application of the Unit

Application of the Unit **2)**

This unit covers the installation and termination of instrument and control cabling and tubing for chemical, industrial or food processing systems or equipment used in medical procedures. It encompasses working safely and to standards, routing cables and tubing to specified locations, terminating cables and tubing and connecting wiring at accessories and at instruments and control apparatus and completing the necessary installation documentation.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install cabling and tubing	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Health and safety risks are identified, and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Installation of cabling and tubing is prepared in consultation with other affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or appropriate person(s) to establish the scope of work to be undertaken.
	1.6	Cable and tube routes are planned within the constraints of the building and plant structure, significants and regulations.
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
	1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
	1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and

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ELEMENT	PERFORMANCE CRITERIA	
		checked for correct operation and safety.
	1.10	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements.
2 Install cabling, tubing and accessories	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Plant/machines/equipment are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Cabling, tubing and accessories are installed to comply with technical standards and job specifications and requirements with sufficient excess to affect terminations.
	2.4	Accessories are installed in the required locations and within acceptable tolerances.
	2.5	Cables and conductors are terminated at accessories in accordance with manufacture's specifications and regulatory requirements
	2.6	Tubing is terminated at accessories in accordance with manufacture's specifications and regulatory requirements
	2.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.9	Ongoing checks of the quality of installed wiring are undertaken in accordance with established procedures.
	2.10	Cabling and tubing installation is carried out efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report installation activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to that the installed wiring conforms to requirements.
	3.4	'As-installed' cables, tubes and accessories are documented and appropriate person(s) notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing instrumentation and control cabling and tubing.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI107A **Instrumentation and control cables, conductors and tubing**

Evidence shall show an understanding of instrumentation and control cables, conductors and tubing to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Instrumentation cable types and terminations encompassing:

- Cable specifications
- Cable applications
- Cable preparation
- Cable termination
- Connection hardware

T2 Instrumentation pneumatic/hydraulic control tubing/piping encompassing:

- Control tubing/piping
- Pneumatic/hydraulic terms
- Cutting pipe tubing/piping
- Bending, shaping/setting pipe and tubing
- Joining connecting/terminating tubing/piping
- Instrumentation air supply maintenance

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some

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circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement

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  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install instrumentation and control cabling and tubing as listed as described in 8) and including:

A	Reading and interpreting drawings related to cable and tube layouts, schedules and control apparatus locations
B	Routing, placing and securing cables and tubing to comply with requirements
C	Placing and securing accessories accurately
D	Maintaining fire integrity
E	Terminating cables and tubing to comply with requirements
F	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing instrumentation and control cabling and tubing.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI108A	Install instrumentation and control apparatus and associated equipment

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to at least three different wiring systems and two types of tubing.

Note:

1. Examples of wiring systems include armoured cable; fire performance cables e.g. MIMS; thermoplastic insulated cable; thermoplastic sheathed cable; UTP, FTP, STP and coaxial communications cables.

2. Tubing types include low pressure metallic and non-metallic tubing and high pressure tubing

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI108A Install instrumentation and control apparatus and associated equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation of measurement, monitoring and control apparatus and associated equipment. It encompasses working safely and to installation standards, matching equipment with that specified for a given location, placing and securing equipment accurately, making required pneumatic, hydraulic and electrical circuit connections and completing the necessary installation documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace`
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each

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scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to instrumentation and control apparatus and associated equipment	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Installation of apparatus is prepared in consultation with other affected by the work and

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ELEMENT		PERFORMANCE CRITERIA	
			sequenced appropriately.
		1.5	The nature and location of the work is determined from documentation or appropriate person(s) to establish the scope of work to be undertaken.
		1.6	Location of instrumentation and control apparatus and associated equipment is planned within the constraints of the building structure, significants and regulations.
		1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others.
		1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements.
		1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.10	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements.
2	Install instrumentation and control apparatus and associated equipment	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Instrumentation and control apparatus and associated equipment is installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Wiring and tubing is terminated at instrumentation and control apparatus and associated equipment in accordance with manufacture's specifications and functional and regulatory requirements.
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures.
	2.9	Apparatus installation is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
3 Completion and report installation activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to that the installed apparatus conforms to requirements.
	3.4	'As-installed' apparatus and associated equipment is documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing instrumentation and control apparatus and associated equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI108A **Instrumentation and control equipment installation requirements and techniques**

Evidence shall show an understanding of instrumentation and control equipment installation requirements and techniques to an extent indicated by the following aspects:

Regulatory requirements

- Equipment specification
- Manufacturer's installation instructions
- System specifications
- Communication/signal cabling installation requirements
- Power wiring requirements
- Initial set up procedures

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that

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can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline,

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work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install instrumentation and control apparatus and associated equipment as listed as described in 8) and including:

A	Reading and interpreting drawings related to and apparatus locations and tubing electrical circuit connections.
B	Placing and securing apparatus accurately
C	Connecting apparatus and associated equipment to comply with requirements.
D	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing instrumentation and control apparatus and associated equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI107A	Install instrumentation and control cabling and tubing

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance

This unit must be demonstrated in relation to at least four different instrumentation and control apparatus and associated equipment.

- pressure measurement apparatus and systems,
- temperature measurement apparatus and systems,
- level/density measurement apparatus and systems,
- flow measurement apparatus and systems, and
- chemical measurement apparatus and systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI110A Set up and adjust advanced PID process control loops

Modification History

		UEENEEI110A	Set up and adjust advanced PID process control loops	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers setting up and adjustment of advanced PID controllers and control elements to specified output. It encompasses working safely and to standards, following set-up and adjustment procedures, applying knowledge of process requirements, testing and reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment

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previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

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Prerequisite Unit(s) **4)**

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops

Electrical Pathway Group

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Instrumentation and Control Pathway Group

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to tune control loop with advance functions	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the

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ELEMENT	PERFORMANCE CRITERIA	
		work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Advanced control loop parameters are identified by reviewing process specification and equipment manuals.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.7	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	1.9	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
2 Tune control loop for advanced functions	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular control system for advanced functions.
	2.3	Control set-point is established and control loop adjusted in accordance with process specification
	2.4	Process is observed and decisions made in consultation with process operation personnel to readjusted control loop settings to ensure process demand and output quality is met.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Process control loops are readjusted as required and checked.
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Ongoing checks of the quality of process output are undertaken to ensure control loop is tuned as required.
	2.9	Tuning is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Completion and report control loop tuning activities	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Control loop settings are documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up process measuring and control instruments.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI110A Advanced process control

Evidence shall show an understanding of advanced process control principles and systems to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Feedforward control strategy encompassing:

- Need for feedforward control
- Operating principles
- Control system adjustments
- Control system difficulties
- Feedback trim
- Configuration diagrams
- Controller configuration.

T2 Cascade control strategy encompassing:

- Need for cascade control
- Operating principles
- Control system adjustments
- Control system problems
- Configuration diagrams
- Controller configuration.

T3 Ratio control strategy encompassing:

- Need for ratio control
- Operating principles
- Control system adjustments
- Configuration diagrams
- Controller configuration

T4 Batch control strategy encompassing:

- Need for batch control
- Operating principles
- Control system adjustments
- Control system controller requirements
- Reset windup
- Configuration diagrams
- Controller configuration

T5 Connection of controllers encompassing:

- Control loop power requirements
- Control loop inputs and outputs
- Instrument connections
- Connecting control loops

T6 Testing of control modes encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Process controller adjustments
- Process control test equipment
- Bench testing procedures
- Bench test connections
- Bench testing process controllers

T7 Process controllers encompassing:

- PID functions
- Applications of PID modes of control
- Applications of controller options
- Checking/adjustment of controllers
- Reset windup

T8 Tuning and installation of control loops encompassing:

- Application of control valves
- Control valve characteristics
- Installation and commissioning control loops
- Tuning control loops
- Microprocessor controller tuning.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to

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include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control

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measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up advanced process measuring and control instruments as listed as described in 8) and including:

A	Identifying advanced control loop parameters
B	Adjusting control loop to satisfy process demand and quality
C	Documenting control loop settings with established procedures
D	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

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- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up advanced process measuring and control instruments.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104	Solve problems in flow measurement components

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A	and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall/may be demonstrated in relation to setting-up and adjusting process control loops with advanced functions for optimum stability and the following:

- Feedforward control
- Cascade control
- Ratio control
- Batch control

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI111A Find and rectify faults in process final control elements

Modification History

		UEENEEI111A	Find and rectify faults in process final control elements	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers finding and repairing faults in final control elements, including control valves, actuators and positioners. It encompasses working safely, interpreting valve specifications, applying knowledge of final control elements operating parameters, conducting tests and repairs and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment based programs incorporated in

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approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI10	Use instrumentation drawings,

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Prerequisite Unit(s) **4)**

1A	specification, standards and equipment manuals
UEENEEI107A	Install instrumentation and control cabling and tubing
UEENEEI108A	Install instrumentation and control apparatus and associated equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair faults in final control elements	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the fault is obtained from documentation, tests or from work supervisor to establish the scope of work to be undertaken.
	1.4	The need to test or measure operating systems is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety
2 Find faults in final control elements and associated equipment	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Fault finding is approached methodically drawing on knowledge of processes, control valves, actuators and positioners using measured and calculated values.
	2.4	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage
	2.5	Faulty components are rechecked and their fault

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ELEMENT	PERFORMANCE CRITERIA	
		status confirmed.
	2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.7	Fault finding activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
3 Rectify faults in final control elements and associated equipment	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures
	3.3	Materials required to rectify faults are sourced and obtained in accordance with established procedures.
	3.4	Rectification and repairs are affected efficiently without damage to other components, apparatus or circuits.
	3.5	Effectiveness of repairs is tested in accordance with established procedures.
	3.6	Apparatus is reassembled, finally tested and prepared for return to service.
	3.7	Repairs are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
4 Completion and report fault finding and rectification activities	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work area is cleaned and made safe in accordance with established procedures.
	4.3	Written justification is made for repairs to control valves

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and rectifying faults in process final control elements and associated equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI111A Final control elements principles and applications

Evidence shall show an understanding of principles of final control elements to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Control valve body and trim types and flow characteristics encompassing:

- body types and their typical applications.
- seating and trim arrangements.
- flow characteristics of various valves.
- Control valve terms - leakage, turndown, rangeability, choked, flow, Cv rating, and perform basic calculations and Cv a rating

T2 Control valve selection encompassing:

- Valve purpose size and characteristic
- Valve manufactures specifications
- Valve faults

T3 Spring opposed diaphragm actuator encompassing:

- control valve actuators
- air-to-raise
- air-to-lower.
- fail-safe action of a valve/actuator combination.
- Actuator characteristics and applications encompassing:
- actuator forces, spring rate values and process pressure on valve performance.
- spring opposed actuator to suit air-to-open and air-to-close valves. Adjust a single seating valve for shut-off.

T4 Valve positioners encompassing:

- valve positioner operation.
- Calibrate/adjust valve positioners for various signals.
- cam and spring feedback positioners on control valves.
- pneumatic, electro-pneumatic and electro hydraulic positioners/actuators.
- Reverse positioner control action and adjust for split range.

T5 Power cylinder (piston actuator) types encompassing:

- test power cylinders.
- extension and retraction forces.
- single acting positive
- single acting negative
- double acting
- Position controllers (positioners)
- Directional control valves and pilot operators

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REQUIRED SKILLS AND KNOWLEDGE

- Power cylinder pilot valve combinations - two, three and five port types, actuation and return modes: solenoid, mechanical, electrical, spring, regulator, filter and lubricator sets and pneumatic control circuits

T6 Self-acting pressure and temperature control valves encompassing:

- pressure or temperature regulating valves.
- self-acting valves to load changes.
- pressure reducing and pressure relief valves.
- self acting valve for required control point

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and rectify faults in process final control elements and associated equipment as listed as described in 8) and including:

A	Using methodical fault finding techniques
B	Finding faults efficiently
C	Replacing/rectifying and repairing components without damage

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D	Providing written justification for the repairs
E	Dealing with unplanned events by drawing on the required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and rectifying faults in process final control elements and associated equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation at least two types of final control elements including the associated equipment.

Note:

1. Examples of control valves types (by application) are additive valves, level control valve, temperature control valve, flow control valve and pressure control valve.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI112A Verify compliance and functionality of instrumentation and control installations

Modification History

		UEENEEI112A	Verify compliance and functionality of instrumentation and control installations	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers pre-commissioning testing and visual inspection for verifying that installed instrumentation and control apparatus in non-hazardous areas is safe and complies with requirements. It encompasses procedures for safely conducting safety tests, conducting visual inspections, identifying non-compliance defects and reporting requirements.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment previously acquired competencies. It is suitable for employment based

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programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

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Prerequisite Unit(s) **4)**

Electrical

Instrumentation and Control

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

Electrical Pathway Group

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

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Prerequisite Unit(s) **4)**

Instrumentation and Control Pathway Group

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to inspect and test a instrumentation and control installations	1.1	OHS measures for the site are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Documentation or deemed to comply standard on which installation is based is reviewed and understood.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety
	1.7	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements
2 Visually inspect the installation.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Instrument cabling and tubing is checked for suitability for the environments in which they are installed and suitably protected from damage.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	The type and configuration/sizing of instrument cabling and tubing is confirmed as meeting that specified for the installation.
	2.6	Evidence that control apparatus complies with safety and installation requirements is cited.
	2.7	Marking of control apparatus is checked for accuracy and clarity and compliance with requirements.
3 Conduct functional and safety testing.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	3.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	3.4	Where process control apparatus operates at low voltage arrangements are made for an authorised person to conduct and report on all required electrical safety tests.
	3.5	Insulation and continuity tests are conducted on process control cabling operating at extra-low voltage.
	3.6	Process control tubing/piping is pressure tested in accordance with established practice.
	3.7	Functional and test are checks are conducted on all process control apparatus in accordance with established practice.
4 Report inspection and test findings	4.1	OHS risk control work completion measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.
	4.3	Non-compliance defects are identified and reported in accordance with established

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ELEMENT	PERFORMANCE CRITERIA	
		procedures.
	4.4	Recommendations for rectifying defects are made in accordance with established procedures.
	4.5	Verification documentation is completed in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and verifying compliance and functionality of process control installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI112A Instrumentation and control system installation, testing and verification methods

Evidence shall show an understanding of process control installation, verification and testing to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Safety working practices encompassing:

- Risk management – purpose/process
- Hazards associated with materials/areas
- Risk control measures associated with materials, areas, electrical equipment, and systems

T2 Equipment selection encompassing:

- Types of test equipment
- Testing techniques

T3 Control loop installation encompassing:

- Instrument selection
- Calibration
- Control loop set up

T4 Test and verification encompassing:

- Visual inspection methods
- Electrical testing
- Pressure testing
- Loop tuning
- Trouble shooting.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best

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utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Verify compliance and functionality of process control installations as listed as described in 8) and including:

A	Selecting correct tools and testing equipment.
B	Identifying visual non-compliance defects
C	Using effective methods for conducting tests
D	Identifying non-compliance from test results.
E	Identifying causes of non-compliance and recommending how these should be rectified.
F	Completing verification documentation
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to verifying compliance and functionality of process control installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to verifying compliance and functionality of at least one electrical/electronic and one pneumatic process control installation comprising a measuring transmitter, controller, final control element, indicator and cabling/tubing.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI113A Setup and configure Human-Machine Interface (HMI) and industrial networks

Modification History

		UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the setting up and configuring human machine interface and industrial networks for process control systems to meet performance standards. This encompasses the adoption of process control schemes that meet safety and process requirements, selection of control equipment and interconnecting cabling and tubing/piping based on calculated and deemed-to-comply arrangements.

Application of the Unit

Application of the Unit

2)

This unit covers the setting up and configuring human machine interface and industrial networks for process

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control systems to meet performance standards. This encompasses the adoption of process control schemes that meet safety and process requirements, selection of control equipment and interconnecting cabling and tubing/piping based on calculated and deemed-to-comply arrangements.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102	Solve problems in pressure measurement

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Prerequisite Unit(s)

4)

A	components and systems
UEENEEI103 A	Solve problems in density/level measurement components and systems
UEENEEI104 A	Solve problems in flow measurement components and systems
UEENEEI105 A	Solve problems in temperature measurement components and systems
UEENEEI110 A	Set up and adjust advanced PID process control loops
UEENEEI106 A	Set up and adjust PID control loops

Electrical Pathway Group

UEENEEG101 A	Solve problems in electromagnetic devices and related circuits
UEENEEG102 A	Solve problems in low voltage a.c. circuits

Instrumentation and Control Pathway Group

UEENEEE119 A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to set-up and configure HMI and industrial networks	1.1	The extent and nature of the control system is determined from job specifications.
		1.2	Safety and other regulatory requirements to which the control system shall comply are identified, obtained and understood
		1.3	Control apparatus and interconnecting components need for the control system and how they are arranged is determined from job specifications and knowledge of process control systems.
2	Set-up and configure HMI and industrial networks	2.1	Manufacturer’s specifications and limitations of appropriate control apparatus is sought and comparisons made with process parameters and control requirements.
		2.2	Control apparatus is selected on compatibility with process parameters and control requirements and environmental conditions.

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ELEMENT		PERFORMANCE CRITERIA	
		2.3	Evidence of specified apparatus IP rating is sought from manufacturer where necessary.
		2.4	Control valves are selected based on percentage travel, flow and loop-and-process characteristics, optimum size, range ability, ability to cope with process pressures and environmental considerations.
3	Select interconnecting cabling and tubing/piping	3.1	Types of control cabling and their configuration are selected to meet environmental conditions and interconnection requirements.
		3.2	Tubing/piping and accessories are sized to meet capacity and pressure requirements
		3.3	Route lengths of cable and tubing/piping are determined from site drawings.
4	Document process control system	4.1	Reasons for selections made, including calculations, are documented in accordance with established procedures.
		4.2	Process control system arrange and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and selecting equipment for process control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI113A HMI and industrial networks

Evidence shall show an understanding of HMI interfacing and industrial networks to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Purpose and application of control system networks systems:

- Open and common proprietary control system networks models (layers) and protocols - CANopen, ControlNet, Devicenet, Ethernet, Foundation Fieldbus, Interbus, Modbus, and Pofibus.
- Control system networks interface.
- Common types of signal conditioning, instruments encompassing:
- principles of operation signal conditioners and instruments
- isolators and protection equipment.

T2 Analogue and digital signals encompassing:

- structure of a typical message block.
- differences between analogue and digital signals.
- typical message block used with a digital telemetry systems.
- Types of transmission links,

T3 Telemetry overview encompassing:

- Definition
- Applications
- Basic principle of operation
- Telemetry standards

T4 Telemetry Components encompassing:

- Analog signals
- Digital signals
- Signal conditioning
- Control system networks
- Connection/link types

T5 Telemetry Systems encompassing:

- Pneumatic
- Current
- Digital
- Wireless
- Microwave
- Optical
- Data Bus

T6 Telemetry Installation encompassing:

- System selection

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REQUIRED SKILLS AND KNOWLEDGE

- Hardware –
- Types of cable, connectors, sources and detectors used in a fibre optic telemetry system
- Interconnection requirements
- Calibration/configuration
- System testing.

T7 Distributive control principles (DCS) encompassing:

- Concepts of a DCS
- differences between hierarchical and distributive systems.
- Functional and geographical distribution.
- Individual features of a DCS -
- Major components in a DCS
- historical and managerial data collection
- type and form of information at the operator and engineering interface levels - programmable logic controllers, SCADA/touch screen systems, system server and smart devices connected by a control network.
- Function block technology to design control algorithm - various loop types, using function block technology from an available DCS.
- Optimum control of a variety of process loops.
- Connection of field instrumentation for selected control operation and diagnostic checking to ensure correct operation of system.
- On-line changes to parameters in a DCS with minimum interference to controlled variable

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Setting up and configuring human machine interface and industrial networks for process control systems as listed as described in 8) and including:

A Setting up control system to comply with safety and other regulatory requirements and process functions

B Configuring human machine interface control systems

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C	Setting up industrial networks for control systems
D	Documenting control system arrangement, specification for items selected and reasons for the selections made
E	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to selecting equipment for process control systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 Use computer applications relevant to a workplace 1A

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to setting up and configuring human machine interface and industrial networks for two process control systems each with more than one input and more than one final control element.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI114A Trouble shoot process control systems

Modification History

		UEENEEI114A	Trouble shoot process control systems	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers finding and rectifying faults in process control apparatus and systems. The unit encompasses safe working practices, interpreting process and circuit diagrams, applying knowledge of process controls to logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also be used to augment formally acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

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Prerequisite Unit(s) **4)**

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops

Electrical Pathway Group

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Instrumentation and Control Pathway Group

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety
2 Find faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Fault finding is approached methodically drawing on knowledge of industrial processes and control apparatus and systems using measured and calculated values of system parameters.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Fault finding activities are carried out without damage to apparatus, circuits, the surrounding

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ELEMENT		PERFORMANCE CRITERIA	
			environment or services and using sustainable energy principles.
3	Rectify fault.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures
		3.3	Materials required to rectify faults are sourced and obtained in accordance with established procedures.
		3.4	Repairs are affected efficiently without damage to other components or apparatus and using sustainable energy principles.
		3.5	Effectiveness of the repair is tested in accordance with established procedures.
		3.6	Apparatus is reassembled, finally tested and prepared for return to customer.
4	Completion and report fault finding and rectification activities	4.1	OHS work completion risk control measures and procedures are followed.
		4.2	Work area is cleaned and made safe in accordance with established procedures.
		4.3	Written justification is made for repairs to apparatus.
		4.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and rectifying faults in process control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI114A	**Trouble shooting process control systems**
	Evidence shall show an understanding of trouble shooting process control systems to an extent indicated by the following aspects:
T1	Factors to consider in clarifying the nature of a fault encompassing: • Initial fault report • Confirmation of symptoms of the fault • Comparison of symptoms with normal operation
T2	Effect to cause reasoning — assumptions of possible causes
T3	Methods for testing assumptions encompassing: • Visual inspection • Sectional testing • Split-half tests • Component isolation
T4	Dealing with intermittent faults - typical causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices & workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and rectify faults in process control systems as listed as described in 10) and including:

A Using methodical fault finding techniques

B Finding faults efficiently

C Rectifying faults without damage

D Providing written justification for the rectifications

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	undertaken
E	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and rectifying faults in process control systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to finding and rectifying faults in two different systems containing more than one control loop.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI115A Trouble shooting in medical equipment control systems

Modification History

		UEENEEI115A	Trouble shooting in medical equipment control systems	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	Replace “process control system” in the second paragraph with “medical equipment control system” to align with the outcome.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers finding and rectifying faults in medical equipment systems. The unit encompasses safe working practices, interpreting process and circuit diagrams, applying knowledge of medical process controls to logical fault finding procedures, effective repairs, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in

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approved contracts of training. It may also be used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and rectify faults	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety
2 Find faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Fault finding is approached methodically drawing on knowledge of medical equipment control systems using measured and calculated values of system parameters.
	2.5	Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Fault finding activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable

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ELEMENT	PERFORMANCE CRITERIA	
		energy principles.
3 Rectify fault.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures
	3.3	Materials required to rectify faults are sourced and obtained in accordance with established procedures.
	3.4	Repairs are affected efficiently without damage to other components or apparatus and using sustainable energy principles.
	3.5	Effectiveness of the repair is tested in accordance with established procedures.
	3.6	Apparatus is reassembled, finally tested and prepared for return to customer.
4 Completion and report fault finding and rectification activities	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work area is cleaned and made safe in accordance with established procedures.
	4.3	Written justification is made for repairs to apparatus.
	4.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and rectifying faults in medical equipment control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI115A **Medical equipment principles and control systems**

Evidence shall show an understanding of medical equipment principles and control systems to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Medical equipment safe working practices encompassing:

- Risk management and assessment of risk -
- Principle and purpose of risk management, and
- Processes for conducting a risk assessment
- Hazards associated with medical equipment-
- Infections
- Toxic materials
- Electrical components
- Radiation
- Risks and control measures associated with working with medical equipment

T2 Medical equipment principles encompassing:

- Equipment function and operation
- Hazards and safety procedures
- Causes of failure
- Safety testing requirements and methods

T3 Cardiovascular systems: blood warmers, cardiac catheterisation systems, defibrillators, electrocardiogram(ECG) machines, electrocardiogram(ECG) monitors, heart-lung machines, infusion pumps, intra-aortic balloon pumps, pacemakers, syringe pump and cardiac output measurement equipment.

T4 Respiratory systems: anaesthetic delivery and monitoring units, medical gases, oxygen concentrator, pulse oximeter, respiratory humidifier, respiratory support units and ventilators.

T5 Neurological systems: electroencephalograph (EEG recorder), electromyograph (EMG recorder) and intracranial pressure monitoring (ICP).

T6 Renal systems: haemodialysis machine, CVVH machine and peritoneal dialysis.

T7 Medical imaging including: x-ray equipment, computerised axial tomography (CT scan), magnetic resonance imaging (MRI), nuclear medicine and diagnostic ultrasound equipment.

T8 Physiological equipment: blood pressure monitors, foetal cardio-tocograph, infant care systems, multiparameter systems, thermometry, telemetry, networking and patient warmers.

T9 Miscellaneous equipment: electrosurgery, electric stimulators, and

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REQUIRED SKILLS AND KNOWLEDGE

endoscopy and laparoscopy systems, laser, operating microscopes, therapeutic diathermy and ultra sound.

T10 Medical equipment, anatomy and physiology and infection control encompassing:

- Nature of infection
- Control of microbial growth
- Infection control strategies
- Body systems

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling

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employment

- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices & workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and rectify faults in medical equipment control systems as listed as described in 8) and including:

A	Using methodical fault finding techniques
B	Finding faults efficiently
C	Rectifying faults without damage
D	Providing written justification for the rectifications undertaken
E	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment,

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the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and rectifying faults in medical equipment control systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to finding and rectifying faults in two items of equipment representative of each of the following categories:

- Cardiovascular systems
- Respiratory systems
- Neurological systems
- Renal systems
- Medical imaging
- Physiological equipment
- Miscellaneous medical equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI116A Assemble, enter and verify operating instructions in microprocessor equipped devices

Modification History

		UEENEEI116A	Assemble, enter and verify operating instructions in microprocessor equipped devices	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers assembling and entering instructions in microprocessor-equipped devices (embedded system) with simple built-in programming function and verifying that the device operates as intended. It encompasses safe working practices, checking device installation, following written and oral instruction and procedures and completing necessary documentation.

Note:

Examples of devices are simple programmable relays, timers, temperature controllers, switches and basic detection devices for security and fire the like.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development

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entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assemble and enter operating instructions.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Safety hazards that have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
		1.4	Work supervisor or customers are consulted to determine which functions of the device are to be use and the parameter of each
		1.5	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
		1.6	Device installation is checked for compliance with job specification and regulations where they apply.
2	Assemble and enter operating instructions.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.3	The required status of each function of the device is entered and their parameters set in accordance with manufacturer programming instructions.
		2.4	Entered data are checked as meeting those specified by the work supervisor or customer.
		2.5	Procedures for referring non-routine events to immediate supervisor for directions are followed.
		2.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
3	Test device operation and report.	3.1	Device operation is tested in strict accordance OHS requirements and procedures.
		3.2	Operating anomalies are identified and corrected in accordance with established routines.
		3.3	OHS work completion risk control measures and

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ELEMENT	PERFORMANCE CRITERIA	
		procedures are followed.
	3.4	Work site is cleaned and made safe in accordance with established procedures.
	3.5	Work completion is reported and appropriate person(s) notified in accordance with established routines.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and entering and verifying operating instruction in basic microprocessor equipped devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI116A **Microprocessor equipped devices**

Evidence shall show an understanding of microprocessor equipped devices to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Overview of digital controllers

- types
- block diagram of controller
- applications
- terms

T2 Controller input and output equipment

- input sensors (transducers)
- current loop concepts
- output current and voltage ratings
- supplementary solid state relays/ contactors

T3 Installation of controllers

- types of input sensors
- wiring
- mounting techniques
- terminal types
- output current protection

T4 Configuration and digital controller set-up

- operator interfaces
- manufacturer’s data
- testing

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Enter and verify operating instructions in microprocessor equipped devices as described in 10) and including:

A Understanding required operating functions and parameters.

B Identifying non-compliance conditions of device installation.

C Entering functions and parameters correctly.

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D	Correcting programming anomalies.
E	Testing and verify device operation.
F	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to enter and verifying operating instructions in microprocessor equipped devices.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3

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'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to assembling, entering and verifying operating instruction in at least two types of microprocessor equipped devices with built-in icon-based programmable functions such as programmable relays, timers, temperature controllers, detection devices for security and fire.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI117A Calibrate, adjust and test measuring instruments

Modification History

		UEENEEI117A	Calibrate, adjust and test measuring instruments	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers calibration, adjustment and testing of measuring instruments. It encompasses working safely and to standards, following calibration and adjustment procedures, applying knowledge of parameters to be measured, testing and reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to calibrate, adjust and test measuring instruments	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the

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ELEMENT		PERFORMANCE CRITERIA	
			work.
		1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
		1.5	Instrument parameters are determined by reviewing process specification and equipment manuals.
		1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety
2	Calibrate, adjust and test measuring instruments	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Calibration testing/measuring arrangement is connected and set up in accordance with manufacturer's instructions and certification requirements for a particular instrument.
		2.3	Factors effecting instrument error are determined and taken into account in the calibration process.
		2.4	Instrument set-point is established and error adjustments are in accordance with manufacture's and compliance specification
		2.5	Instrument is tested and adjustment made as necessary to ensure instrument meets calibration requirements.
		2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.8	Ongoing checks of the quality of process output are undertaken to ensure control loop is tuned as

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ELEMENT	PERFORMANCE CRITERIA	
		required.
	2.9	Calibration is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Completion and report calibration activities	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Calibration is documented in accordance with certification requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and calibrating and testing measuring instruments.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI117A Calibration of measuring instruments

Evidence shall show an understanding of calibration of measuring instruments to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Measurement standards applicable to scientific instruments encompassing:

- Standards philosophy and format
- How to read and apply a standard.
- Certificate standards that apply to scientific instrumentation
- Scientific instrumentation certification process

T2 Fundamentals of calibration encompassing:

- Calibration processes
- Need for calibration
- Metrology standards
- Traceability
- Electrical measuring instruments and devices
- High order frequency references
- Counters
- Signal and function generators

T3 Calibration techniques encompassing:

- Principles of common calibration techniques
- Purpose of Standards and calibration certification
- Minimising error during calibration -
- source and type of errors
- techniques to minimise errors during measurements
- calculating the degree of error and calibration factors
- Determining the parameters to which the device will be calibrated
- Need for normal performance check.
- Purpose of calibration documentation

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Calibrate and test measuring instruments as listed as described in 10) and including:

A Identifying instrument parameters

B Setting up calibration arrangement in accordance with manufacturer's instructions and certification requirements for a particular instrument.

C Determining factors effecting error

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D	Calibrating instrument to measure within specified tolerance
E	Documenting calibration with certification requirements
F	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to calibrating and testing measuring instruments.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to calibrating, adjusting and testing measuring at least one electrical/electronic and one non-electrical instrument.

The calibrated instruments measure accurately within the prescribe tolerance.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI118A Set up weighting measuring and control instruments

Modification History

		UEENEEI118A	Set up weighting measuring and control instruments	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the calibration of instruments for measuring the weight of material as it applies to the control of processes. It encompasses working safely and to standards, following set-up and calibration procedures, testing and reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment

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previously acquired competencies.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE1	Use drawings, diagrams, schedules,

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Prerequisite Unit(s) **4)**

07A	standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set-up weighting measuring instruments	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Measurement parameters are identified by reviewing process requirements and instrument manufacturer's service manual.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.7	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	1.9	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
2 Set-up weighting measuring instruments	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular control system.
	2.3	Measuring instruments are set up and adjusted in accordance with process requirements and

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ELEMENT	PERFORMANCE CRITERIA	
		instrument manufacturer service manual.
	2.4	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Setting-up is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Completion and report set-up activities	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Adjustment settings are documented and appropriate person(s) notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up weight measuring and control instruments.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI118A **Weight measurement principles**

Evidence shall show an understanding of weighing measurement principles to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Weighing and the relationship between force and weighing.

T2 Methods of weighing and common factors affecting weighting system performance.

T3 Principles of strain gauge measurement encompassing:

- compression and tension stress.
- relationship between stress and strain.

T4 Principles of operation of various load cells in common use encompassing:

- Pneumatic and hydraulic load cells.
- Linear Voltage Differential Transformer

T5 Methods of weighing materials in motion encompassing:

- weigh feeder control
- method of calibration of a belt weigher.
- operation of a nuclear radiation conveyor weigher and the safety precautions to be observed.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work

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environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up weighting measuring and control instruments as listed as described in 10) and including:

A	Identifying weighting measurement parameters
B	Setting-up and adjusting in accordance with process requirements and instrument manufacturer's service manual
C	Documenting adjustment settings with established procedures
D	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

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- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above, evidence should show demonstrated competency setting up weight measuring and control instruments.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to setting up and adjusting two different types of weighting measuring instruments.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

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UEENEEI119A Set up industrial field control devices

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit.	
2	Edit	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Edit	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Edit	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	
3	Edit	N/A	In Pre-requisites, edit name to reflect correct unit title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers setting up industrial field control devices such as transducers, sensors, and actuators. It encompasses working safely, following design brief, applying knowledge of device operating principles, interpreting device specifications, following manufacturer’s set up specifications, testing device operation and documenting set up parameters.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program

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that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace for work involving direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All

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Prerequisite Unit(s)

4)

competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI139A	Diagnose and rectify faults in digital controls systems

Electrical Pathway Group

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

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Prerequisite Unit(s)

4)

Instrumentation and Control Pathway Group

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set up industrial field control devices	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The field devices to be set up are determined from control system specifications and in consultations with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Set up industrial field control devices	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Devices are set up drawing on knowledge of field device and operation, characteristics and applications.
	2.3	Devices are positioned and adjusted in accordance with their operating principles, manufacturer instructions and control system requirements.
	2.4	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.5	Setting up devices is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Test and document set up of industrial field control devices	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Field devices are tested and final adjustments made to correct any anomalies in their operation.
	3.3	Field device set up is documented in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up field control devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI119A Industrial Field Control Devices

Evidence shall show an understanding of industrial field control devices to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Industrial processes and the terminology used in measurement encompassing:

- Forms of energy
- General classification of transducers
- Measurement technology
- Static accuracy.

T2 Devices used in optoelectronic systems encompassing:

- Physics of light
- Spectral response
- Photometry
- Light sources and detectors
- Len's and mirror theory
- Optoelectronic systems and photoelectric switches
- Optoelectronic circuits
- The laser

T3 Temperature detection and measurement and their circuit configurations encompassing:

- Introduction to temperature sensing
- Bimetallic and filled thermal sensors
- Thermocouples, resistance temperature detectors, thermistors, solid state temperature, sensors, integrated circuit temperature sensors and phrometers
- Control circuits using temperature detectors.

T4 Measurement of pressure, flow and chemical encompassing:

- Diaphragm, bellows and venturi
- Strain gauges and load cells
- Ultrasonic and magnetic flowmeters
- Measurement technology and accuracy
- Viscosity, humidity and pH

T5 Linear, angular and rotary motion detection encompassing:

- Linear motion sensors
- Angular and rotary motion sensors
- Shaft angle encoders
- Linear encoders
- Tachometers
- Accelerometer and vibrometer

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REQUIRED SKILLS AND KNOWLEDGE

T6 Proximity and level detection encompassing:

- Mechanical
- Ultrasonics
- Microwave
- Passive infrared
- Nucleonics
- Capacitive and inductive proximity

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up field control devices as listed as described in 10) and including:

A	Determining the field control devices to be set up
B	Positioning and adjusting devices accordance with their operating principles, manufacturer instructions and control system requirements
C	Testing field devices and making final adjustments to correct any anomalies in their operation
D	Documenting field control device set up in accordance established procedures
E	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

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Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to setting up field control devices.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to setting up at least four different industrial field control devices.

Note.

Examples are field control devices measurement/detection of flow, temperature, pressure, density, weight, level, smoke, motion.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI120A Provide solutions to problems in industrial control systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Correct literacy, numeracy and writing scale	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
3	Edit	N/A	In Pre-requisites, edit name to reflect correct unit title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers solving problems in industrial control systems. The unit encompasses safe working practices, interpreting process and circuit diagrams, applying knowledge of industry controls to problem solving techniques, safety and functional testing and completing the necessary documentation.

Note.

Typical basic industrial control system problems are those encountered in meeting performance requirements and compliance standards, revising control operating parameters and dealing with control malfunctions.

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Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace for work involving direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after

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Prerequisite Unit(s)

4)

competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI139A	Diagnose and rectify faults in digital controls systems

Electrical Pathway Group

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG1	Terminate cables, cords and accessories for

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Prerequisite Unit(s)

4)

06A	low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Instrumentation and Control Pathway Group

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide solutions to industrial control system problems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of industrial control system problems are determined from performance specifications and situation reports and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Provide solutions to industrial control system problems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of industrial control system device and circuit operation, characteristics and applications are applied to developing solutions to control problems.
		2.3	Parameters, specifications and performance requirements in relation to each industrial control system problems are obtained in accordance with established procedures.
		2.4	Approaches to resolving industrial control system problems are evaluated to provide most effective solutions.
		2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.6	Problems are solved efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Test and document solutions to industrial control system problems	3.1	OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Solutions to industrial control system problems are tested to determine their effectiveness and modified where necessary.
		3.3	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed. (See Note)
		3.4	Justification for solutions used to solve industrial control system problems are documented in accordance with established procedures.

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ELEMENT **PERFORMANCE CRITERIA**

Note:

A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing solutions to problems in industrial control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI120A **Industrial control systems**

Evidence shall show an understanding of industrial control systems to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1

Control amplifiers encompassing:

- Introduction
- Amplifier Operation
- Operational Amplifiers
- Operational Amplifier Configurations

T2

Industrial transducers encompassing:

- Introduction
- SI Units
- Forms of Energy
- Transducer Terminology
- Temperature Measurement
- Force Measurement
- Speed Measurement
- Positional Measurement

T3

Industrial final control elements encompassing:

- Introduction
- Electromagnetic Devices
- Valves
- Solid State Switching Devices

T4

Industrial control systems encompassing:

- Automatic Control
- Open Loop Control
- Closed Loop Control
- Control System Terminology
- Control System Evaluation
- Two Position Control
- Proportional Control (P)
- Proportional + Integral Control (P+I)
- Proportional + Derivative Control (P+D)
- Proportional + Integral + Derivative Control (P+I+D)

T5

Industrial control loops and control signals encompassing:

- Introduction
- Control Loops
- Converters (D to A and A to D)
- Multiplexing

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for

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Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide solutions to problems in industrial control systems as described in 8) and including:

A Understanding the extent of the industrial control system problem

B Obtaining electronic device and circuit parameters, specifications and performance requirements

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	appropriate to each problem.
C	Testing and solutions to industrial control system problems
D	Documenting justification of solutions implemented in accordance established procedures
E	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing solutions to problems in industrial control systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to providing solutions to at least four industrial control system problems.

Note.

Examples are process control, speed control, positional control.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and control

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UEENEEI121A Trouble shoot in measuring and analysis systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers finding and repairing faults in measuring and analysis systems. It encompasses working safely, reading circuit diagrams and device specifications, applying logical fault finding procedures, conducting repairs and completing the necessary service documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also be used to augment formally acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States and Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEI112A	Verify compliance and functionality of instrumentation and control installations

AND

UEENEEI11	Set up weighting measuring and control

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Prerequisite Unit(s) **4)**

8A	instruments
OR	
UEENEEI131A	Set up gas analysis measuring and control instruments
OR	
UEENEEI132A	Set up water analysis measuring and control instruments
OR	
UEENEEI133A	Set up scientific analysis measuring and control instruments

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to find and repair faults	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Find and repair faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Fault finding is approached methodically drawing on knowledge of measuring and analytical equipment and circuit using measured and calculated values of apparatus parameters.
	2.5	Equipment components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.6	Faulty components are rechecked and their fault status confirmed.
	2.7	Faulty components are readjusted or replaced in accordance with established procedures.
	2.8	Effectiveness of the repaired component is tested in accordance with established procedures.
	2.9	Apparatus is reassembled, finally tested and prepared for return to customer.
	2.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.11	Fault finding and repair activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Completion and report fault finding and repair activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work area is cleaned and made safe in accordance with established procedures.
	3.3	Written justification is made for repairs to apparatus, including components and materials used.
	3.4	Acceptance that the reported fault(s) have been repaired is sought from an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing faults in measuring and analysis systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI121 A **Trouble shooting measuring and analysis systems**

Evidence shall show an understanding of measurement circuits and applications to an extent indicated by the following aspects:

- Principles of measurement
- Circuit components and configurations
- Applications of measurement circuits

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work

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environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and repair faults in measuring and analysis systems as described in 10) and including:

A	Using methodical fault finding techniques
B	Finding faults efficiently
C	Replacing components without damage
D	Providing written justification for the repairs
E	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to finding and repairing faults in measuring and analysis systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to finding and repairing at least four faults in two different types of measuring and analytical equipment.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and control

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UEENEEI122A Assist in commissioning process and instrumentation control systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers commissioning of process control systems. It encompasses working safely and with others, complying with requirements, applying knowledge of process and control components, pre-commissioning tests, following start up procedures, checking and adjusting components and controls to ensure efficient and safe operation and completing commissioning documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

Common Unit Group

UEENEEI11	Verify compliance and functionality of instrumentation and process control

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Prerequisite Unit(s) **4)**

2A	installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks
Electrical Pathway Group	
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
Instrumentation and Control Pathway Group	
UEENEEE1	Solve problems in multiple path extra low

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Prerequisite Unit(s) **4)**

19A voltage (ELV) a.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assist in commissioning process control systems	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Commissioning plan is review with other team members to ensure commissioning procedures and the role of each member is understood and to ensure the work is coordinated effectively.
	1.5	Measurement parameters are identified with the team by reviewing process requirements and equipment manufacturer instructions.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.7	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	1.9	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
2 Assist in commissioning process control systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Commissioning testing/measuring devices are connected and set up in accordance with requirements for a particular control system and team instructions.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Process instruments and apparatus are set up and adjusted in accordance with process control requirements and equipment manufacturer instructions and team instructions.
	2.4	Adjustments are made to provide optimum transmission/reception performance within regulatory requirements.
	2.5	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and from job specifications
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.7	Commissioning assistance is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Completion and report commissioning activities	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Adjustment settings are documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assisting in commissioning process control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI122A	**Process control, commissioning**
	Evidence shall show an understanding of commissioning process control instruments and systems to an extent indicated by the following aspects:
T1	Purpose of commissioning
T2	Commissioning planning and documentation
T3	Procedures for commissioning instrumentation encompassing: • configuring • calibrating • tuning • validating system to drawings • procedures followed to commission instrument systems
T4	Purpose and importance of documentation

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assist in commissioning process control systems as described in 10) and including:

A Understanding the role of each commission team member

B Connecting and setting-up commissioning testing/measuring devices in accordance with requirements for a particular control system and team instructions

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C	Setting-up and adjusting process instruments and apparatus in accordance with process control requirements and equipment manufacturer instructions and team instructions.
D	Documenting adjustment settings in accordance with established procedures.
E	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assisting in commissioning process control systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to process control systems incorporating closed loop control and digital and analogue elements and with at least five interacting control functions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI123A Design electronic control systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
3	Edit	N/A	In Pre-requisites, edit name to reflect correct unit title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers designing electronic control systems incorporating closed loop and digital and analogue elements. It encompasses working safely, following design brief, applying knowledge of digital and analogue devices, interpreting device specifications, constructing prototypes, using appropriate development software, applying programming techniques, testing developed system prototype operation and documenting design and development work.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal

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recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE1	Use drawings, diagrams, schedules,

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Prerequisite Unit(s) **4)**

07A	standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI139A	Diagnose and rectify faults in digital controls systems
Electrical Pathway	
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
Instrumentation Pathway	
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI10	Solve problems in flow measurement

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Prerequisite Unit(s) **4)**

4A	components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design electronic control systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the proposed electronic control system is determined from the design brief or in consultations with appropriate person(s)
	1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site
	1.5	Materials and devices/components required for the work are determined on compatibility of their specifications with control system requirements and project budget constraints.
2 Design electronic control systems	2.1	OHS risk control work measures and procedures are followed.
	2.2	Knowledge of digital and analogue elements used in control systems and compliance standards are applied to the design
	2.3	Alternative arrangements for the design are considered based on the requirements outlined in the design brief.
	2.4	Safety, functional and budget considerations are incorporated in the design.
	2.5	Prototype devices and circuits are constructed, programmed and tested for compliance with the

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ELEMENT	PERFORMANCE CRITERIA	
		design brief and regulatory requirements.
	2.6	Prototype malfunctions are rectified and retested to ensure effective operation of design.
	2.7	Control system design is documented for submission to appropriate person(s) for approval
	2.8	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for electronic control systems design	3.1	Control system design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing electronic control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI12 3A Designing complex control systems

Evidence shall show an understanding of complex control systems indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Control systems encompassing:

- process controller and programmable controllers and personal computer
- control peripherals suitable control

T2 Purpose built microprocessor controller multiple inputs resulting in different or changed outputs

T3 Different types and applications of system transducers and sensors

T4 Actuators and drive systems.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

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access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing

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requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design electronic control systems as described in 10) and including:

A	Developing outlines of alternative designs,
B	Developing the design within the safety and functional requirements and budget limitations,
C	Documenting and presenting design effectively,
D	Successfully negotiating design alteration requests
E	Obtaining approval for final design
F	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing electronic control systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to an electronic control system incorporating closed loop control and digital and analogue elements and with at least five interacting control functions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repairing analogue applications in electronic control systems. The unit encompasses safe working practices, interpreting diagrams and technical data, applying knowledge of analogue circuits and components to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Note.

Examples of analogue applications are power and differential amplifiers, integrators, comparators function generators precision rectifiers, active filters and the like.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable

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for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have

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Prerequisite Unit(s)

4)

been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Instrumentation and Control

Electrical

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Instrumentation and Control Pathway Group

Unit Code	Unit Title
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI112A	Verify compliance and functionality of instrumentation and control

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Prerequisite Unit(s) **4)**

	installations
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

Electrical Pathway Group

Unit Code	Unit Title
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 4 Writing 4 Numeracy 5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to fault find and repair	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and fro discussion with

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ELEMENT	PERFORMANCE CRITERIA	
		appropriate personnel
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Fault find and repair	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Logical diagnostic methods are applied to diagnose electronic control system apparatus faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the cause(s) of system fault.
	2.6	Cause of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the analogue circuits and components.
	2.7	Faults in the electronic components of the system are rectified to raise apparatus and system to its operational standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate

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ELEMENT	PERFORMANCE CRITERIA	
		persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report fault find and repair activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and fault finding and repairing analogue circuits and components in electronic control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI124A **Analogue electronic control systems**

Evidence shall show an understanding of analogue electronic control systems indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Amplifier fundamentals

- The purpose and application of amplifiers
- The basic characteristics of small signal amplifiers.
- The ideal op amp

T2 Basic op-amp configurations

- Various operational amplifier circuit configurations and where they are used.
- Measured and calculated values of gain and output voltage for various operational amplifier configurations
- Circuit configurations:
  - inverting,
  - non-inverting,
  - voltage follower,
  - summing
  - comparators
  - Schmitt trigger
  - differential configurations

T3 Op amp limitations

- Use of frequency compensation,
- Offset null,
- Bias compensation
- Slew rate
- Frequency response
- Bandwidth
- Noise figures.

T4 Single stage amplifiers

- Determination of d.c. bias conditions for a single-stage amplifier
- Small signal terminal characteristics of single-stage amplifiers
- Effects of coupling and by-pass capacitors in single-stage amplifiers

T5 Amplifier applications

- Operation of multistage amplifiers
- Effects of component values and frequency response
- Negative feedback loop in multistage amplifiers
- Negative feedback and amplifier parameters

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REQUIRED SKILLS AND KNOWLEDGE

- Effects on the output voltage when amplifiers are subjected to control signal overdrive, bias faults and amplifying device faults

T6 Op amp/diode circuits

- Clippers
- Clamp circuits
- Precision rectifiers

T7 Oscillators

- Oscillator circuits using op amps
- sine wave
- square wave
- triangular wave
- sawtooth

T8 Op amp/RC circuits

- Integrator
- Differentiator
- Function generators

T9 Filters

- Active filter circuits
- First and second order
- Low, high and band pass circuits

T10 Timers

- Operation of typical timer ICs

T11 Power amplifiers

- Power output ICs
- Power amplifiers using op amps
- Power supplies

T12 Multi-stage circuits

- Circuits using several different op amp configurations.
- Fault-finding procedures

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Fault finding and repairing analogue circuits and components in electronic control systems as described in 8) and including:

A Applying logical diagnostic methods.

B Using fault scenarios to test the cause(s) of system faults.

C Identifying faults and their cause and competency

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needed to rectify them.

D	Rectifying faults in system analogue circuits and components.
E	Verifying that the system operates correctly.
F	Documenting fault rectification.
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in analogue circuits and components in electronic control systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified required skills and knowledge are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by fault finding and repairing at least four of the following faults in analogue circuits and components:

- Open-circuit
- Short-circuit
- Incorrect or failed connections
- Insulation failure
- Unsafe condition
- Apparatus/component failure
- Related mechanical failure

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI125A Provide solutions to fluid circuit operations

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the solution to problems associated with the operation of fluid controlled circuits. It encompasses working safely, problem solving procedures, including using measuring instruments, applying appropriate circuit theorems and providing solutions derived from measurements and calculations and justification for such solutions.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher. It may also be suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of fluid operated automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide solutions to fluid circuit problems	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety

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ELEMENT	PERFORMANCE CRITERIA	
2 Provide solutions to fluid circuit problems	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure active circuits is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Established methods are used for solving circuit problems from measure and calculated values, as they apply to fluid circuits.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices with the minimum waste and rework
3 Complete work and document solutions to discovered problem	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve circuit problems is documented.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing solutions to fluid circuit operations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI125A	**Fluid power control**
	Evidence shall show an understanding of fluid power control to an extent indicated by the following aspects:
T1	Terms and there definitions used in fluid power systems
T2	Applications of fluid power
T3	Pascal's law as it relates to force transfer, multiplication and intensification
T4	Mathematical relationships involving temperature and volume (Charles law), pressure and volume (Boyles law), pressure and volume (Boyles law) and there combinational relationships
T5	Fluid power principles related to components and the identification of components
T6	Operation of fluid power components
T7	Interpretation of fluid system operation from circuit diagrams
T8	Operation and construction of basic pneumatic circuit
T9	Operation and construction of a basic hydraulic circuit
T10	Routing maintenance procedures
T11	Safety requirement

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide solutions to fluid circuit operations as described in 8) and including:

A	Determining the operating parameters of existing circuit
B	Using established problem solving methods
C	Taking relevant measurements accurately

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D	Interpreting measured values appropriately
E	Providing effective solutions to circuit problems from measurements and calculations
F	Giving written justification of solutions provided
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing solutions to fluid circuit operations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires

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assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to fluid power circuits as they apply to problems related to engineering diagnosis and development work functions in any 2 of the following types of circuit problems:

- determining the operating parameters of an existing circuit
- altering an existing circuit to comply with specified operating parameters
- developing circuits to comply with a specified function and operating parameters

In relation to either types of the following pumps and their associated control equipment:

- hydraulic
- pneumatic

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI126A Provide solutions to pneumatic-hydraulic system operations

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
2	Edit	N/A	Insert the words "pneumatic" and "hydraulic" to Required Skills and Knowledge to differentiate between T4 and T9	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the set-up and maintenance of pneumatic and hydraulic systems. It encompasses working safely, problem solving procedures, including using measuring instruments, applying appropriate circuit theorems and providing solutions derived from measurements and calculations and justification for such solutions.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher. It may also be suitable for employment-based programs under an approved contract

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of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of pneumatic and hydraulic operated automated machinery

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI125A	Provide solutions to fluid circuit operations

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each

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scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to provide solutions to pneumatic/hydraulic system operations	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the system problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Provide solutions to pneumatic/hydraulic system operations	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure active systems is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Systems are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Established methods are used for solving system problems from measure and calculated values, as they apply to pneumatic/hydraulic circuits.
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices with the minimum waste and rework.
3	Complete work and document solutions to discovered problem	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve system problems is documented.
		3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing solutions to pneumatic/hydraulic system operations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI126A	**Pneumatics and hydraulics systems**
	Evidence shall show an understanding of pneumatics and hydraulics to an extent indicated by the following aspects:
T1	Terms and there definitions used in pneumatic components and systems
T2	Application, operation and installation requirements of pneumatic components and systems
T3	Interpretation and selection of manufacturers equipment specifications to establish the performance of pneumatic components
T4	Construct pneumatic circuits from control diagrams
T5	Location and correction of faults on pneumatic components and systems
T6	Terms and there definitions used in hydraulics components and systems
T7	Application, operation and installation requirements of hydraulic components and systems
T8	Interpretation and selection of manufacturers equipment specifications to establish the performance of hydraulic components
T9	Construct hydraulic circuits from control diagrams
T10	Location and correction of faults on hydraulics components and systems

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide solutions to pneumatic/hydraulic system operations as described in 8) and including:

A Determining the operating parameters of existing systems

B Using established problem solving methods

C Taking relevant measurements accurately

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D	Interpreting measured values appropriately
E	Providing effective solutions to system problems from measurements and calculations
F	Giving written justification of solutions provided
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing solutions to pneumatic/hydraulic system operations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires

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assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to pneumatic/hydraulic power systems as they apply to problems related to engineering diagnosis and development work functions in any of the following:

- determining the operating parameters of an existing system
- altering an existing system to comply with specified operating parameters
- developing systems to comply with a specified function and operating

In relation to both types of the following systems:

- Pneumatics – any two of the following main components:
  - Cooler
  - Dryer
  - Filter
  - Receiver
- Control devices – any two of the following components:
  - Linear actuator
  - Rotary actuator
  - Directional control valve
  - Timer
  - Counter
- Hydraulics – any two of the following main components:
  - Two cylinder sequenced system
  - Single cylinder skip-check system
- Control devices – any two of the following components:
  - Rotary actuators
  - Linear actuators
  - Directional control valve
  - Rotary control valve
  - Pressure control valve

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI127A Analyse complex electronic circuits controlling fluids

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the analysis of complex electronic control circuits that integrate with the operation of fluid control systems on machinery. It encompasses working safely, applying extensive knowledge of equipment and electronic and fluid control circuit operations, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF

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level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI125A	Provide solutions to fluid circuit operations

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 3 Writing 3 Numeracy 3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to analyse complex circuits controlling fluids.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the circuit analysis is determined from performance specifications and situation reports and in consultations with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in

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ELEMENT		PERFORMANCE CRITERIA	
			the work.
		1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2	Analyse complex circuits controlling fluids	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of complex control concepts and electro-fluid control circuits are applied to developing analytical solutions to machine parameters.
		2.3	Parameters, specifications and performance requirements in relation to each circuit are obtained in accordance with established procedures.
		2.4	Approaches to analysing circuit parameters are carried out to provide the most effective solution.
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
		2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3	Document and report on the results of the circuit analysis and actions taken.	3.1	Solutions to circuit analysis are tested to determine their effectiveness and modified where necessary.
		3.2	Analysis is documented including details of all findings, calculations and assumptions.
		3.3	Analysis is reported to appropriate personnel to establish suitable action to be taken based on findings.
		3.4	Justification for findings and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with

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ELEMENT	PERFORMANCE CRITERIA
	professional standards.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and analysing complex electronic circuits controlling fluids.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI127A Electronic control of fluid processes

Evidence shall show an understanding of interfacing electronics with hydraulic and pneumatic devices and systems to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1	Determining control static and dynamic operating conditions for stages in a control process from block diagrams
T2	Identification of process characteristics from process test data and process flow diagrams
T3	Linearisation functions and feedback
T4	Placement of sensors and actuators to eliminate dead time
T5	Lag reduction strategies
T6	Consideration of steady state gain vs. offset and stability vs. performance
T7	Controller tuning and calibration
T8	Analyse control system functions
T9	Construct a time-displacement diagram for a functional system
T10	Design relay logic ladder diagram for the system
T11	Identification of components required by a fluid power circuit
T12	Selection of proportional valves to suit fluid applications
T13	Determination of ramp time for motor and cylinder circuits
T14	Determine maximum flow rates in cylinder circuits that accelerate and decelerate a load and selection of an appropriate valve spool
T15	Determine pressure in cylinder circuits
T16	Design fluid power circuits using proportional valves
T17	Adjust points on a proportional valve control card to meet specifications

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse complex electronic circuits controlling fluids as described in 8) and including:

A Understanding the operation of electronic and fluid controls

B Forming effective strategies for analysing circuit performance

C Obtaining circuit control parameters,

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	specifications and performance requirements appropriate to each situation.
D	Testing the results of the analysis
E	Documenting instruction for implementing any actions resulting from the analysis that incorporates risk control measure to be followed.
F	Documenting justification of actions to be implemented in accordance with professional standards
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to analysing complex electronic circuits controlling fluids.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI126A	Provide solutions to pneumatic/ hydraulic system operations

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to analysing complex circuits controlling integrated electro-fluid systems on at least 2 types of machine:

Note.

Typical circuits are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI128A Set up and configure controls on complex fluid systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
3	Edit	N/A	In Pre-requisites, edit name to reflect correct unit title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the setting up, adjustment, maintenance and modification of electronically controlled complex systems that are integrated with hydraulic devices. It encompasses working safely, applying extensive knowledge of complex circuits designed to operate fluid systems and the integration to hydraulics, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note:

Typical problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

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Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 6

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE1	Fabricate, assemble and dismantle utilities

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Prerequisite Unit(s) **4)**

02A	industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI127A	Analyse complex electronic circuits controlling fluids
UEENEEI139A	Diagnose and rectify faults in digital controls systems

Electrical Pathway Group

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Instrumentation and Control Pathway Group

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment

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Prerequisite Unit(s) **4)**

	manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of

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Employability Skills **5)**

competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set up controls on complex fluid systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the work to be undertaken is determined from performance specifications and situation reports and in consultations with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Effective strategies are determined to ensure solutions developed and related implementation is carried out efficiently.
2 Set up controls on complex fluid systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of complex controls and integrated fluid systems are applied to developing analytical solutions to machine parameters and

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ELEMENT	PERFORMANCE CRITERIA	
		operation.
	2.3	Parameters, specifications and performance requirements in relation to each control circuit and fluid device are obtained in accordance with established procedures.
	2.4	Approaches to setting up, maintenance and/or modification are carried out to provide the most effective solution(s).
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3 Document and report on the results of the set up and actions taken.	3.1	Solutions to set up, maintenance activity and/or modification are tested to determine their effectiveness and modified where necessary.
	3.2	Set-up, maintenance activity and/or modification is documented including details of all findings, calculations and assumptions.
	3.3	Set-up, maintenance activity and/or modification is reported to appropriate personnel to establish suitable action to be taken based on findings.
	3.4	Justification for findings and any actions to be undertaken in relation to the work activity is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up controls on complex fluid systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI128A	**Complex fluid control systems**
	Evidence shall show an understanding of advanced fluid mechanics to an extent indicated by the following aspects:
T1	The relationship between Reynolds Number and flow regime
T2	Head loss in pipes and fittings and system head curves
T3	Head loss in parallel and serial pipes and how systems can be reduced to an equivalent single pipe system for analytical purposes
T4	Flow rates through open channels
T5	Positive displacement and rotodynamics of fluid machinery
T6	Duty point for a pump in a system including flow rate and head pressure
T7	Cavitations and the influence of inlet system design and fluid temperature and pressure on cavitations
T8	Circuits and operation of fluid hydraulic componentry in a system
T9	Technical specifications and associated data for the selection of hydraulic components for machine control operation
T10	Installation requirements for the installation, commissioning and testing hydraulic components and systems

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up controls on complex fluid systems as described in 8) and including:

A	Understanding the operation of electronic and hydraulic controls
B	Forming effective strategies for analysing circuit and hydraulic performance
C	Obtaining circuit control and hydraulic

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	parameters, specifications and performance requirements appropriate to each situation.
D	Testing the results of the analysis
E	Documenting instruction for implementing any actions resulting from the analysis that incorporates risk control measure to be followed.
F	Documenting justification of actions to be implemented in accordance with professional standards
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to setting up controls on complex fluid systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to setting up electronically controlled fluid operated complex systems on at least 2 types of machines.

Note.

Typical circuits are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

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UEENEEI129A Set up electronically controlled mechanically operated complex systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
3	Edit	N/A	In Pre-requisites, edit name to reflect correct unit title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the setting up, adjustment, maintenance and modification to electronically controlled mechanically operated complex systems. It encompasses working safely, applying extensive knowledge of electronic circuits and the integration to mechanically operated equipment and systems, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note:

Typical problems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

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Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE1	Fabricate, assemble and dismantle utilities

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Prerequisite Unit(s) **4)**

02A	industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI127A	Analyse complex electronic circuits controlling fluids
UEENEEI139A	Diagnose and rectify faults in digital controls systems

Electrical Pathway Group

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Instrumentation and Control Pathway Group

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment

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Prerequisite Unit(s) **4)**

	manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of

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Employability Skills	**5)** competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set up electronically controlled mechanically operated complex systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	The extent of the work to be undertaken is determined from performance specifications and situation reports and in consultations with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently

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ELEMENT	PERFORMANCE CRITERIA	
2 Set up electronically controlled mechanically operated complex systems	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Knowledge of complex controls and integrated mechanical systems are applied to developing analytical solutions to machine parameters and operation
	2.3	Parameters, specifications and performance requirements in relation to each circuit and mechanical device are obtained in accordance with established procedures
	2.4	Approaches to setting up, maintenance and/or modification are carried out to provide the most effective solution
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3 Document and report on the results of the set up and actions taken.	3.1	Solutions to set up, maintenance activity and/or modification are tested to determine their effectiveness and modified where necessary
	3.2	Set up, maintenance activity and/or modification is documented including details of all findings, calculations and assumptions
	3.3	Set up, maintenance activity and/or modification is reported to appropriate personnel to establish suitable action to be taken based on findings
	3.4	Justification for findings and any actions to be undertaken in relation to the work activity is documented for inclusion in work/project or development records in accordance with professional standards

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up electronically controlled mechanically operated complex systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI129A	**Electronic interfacing to mechanical systems**
	Evidence shall show an understanding of interfacing electronics with mechanical devices and systems to an extent indicated by the following aspects:
T1	Connection of sensors and actuators to an interface for communications with a discrete device electronic controller or programmable controller or computer for the operation of a process requiring continuously variable changes
T2	Description of the logic sequence for the integrated system including: operator actions, input signals, output actions, interlocks and safety and emergency requirements
T3	Transformation of the system logic into a program to carry out the desired task using a port address on a computer using programming software and codes
T4	Commissioning systems and perform fault diagnosis using computer automation
T5	Operation of circuits controlling hydraulics
T6	Technical specifications and data for the selection of hydraulic components for machine control
T7	Installation, commissioning and testing hydraulic systems

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up electronically controlled mechanically operated complex systems as described in 8) and including:

A	Understanding the operation of electronic and mechanical controls
B	Forming effective strategies for analysing circuit and mechanical performance
C	Obtaining circuit control and mechanical

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	parameters, specifications and performance requirements appropriate to each situation.
D	Testing the results of the analysis
E	Documenting instruction for implementing any actions resulting from the analysis that incorporates risk control measure to be followed.
F	Documenting justification of actions to be implemented in accordance with professional standards
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to setting up electronically controlled mechanically operated complex systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI130A	Set up electronically controlled robotically operated complex systems

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to setting up electronically controlled mechanically operated complex systems on at least 2 types of machines.

Note.

Typical systems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Instrumentation and Control

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UEENEEI130A Set up electronically controlled robotically operated complex systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
3	Edit	N/A	In Pre-requisites, edit name to reflect correct unit title UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the setting up, adjustment, maintenance and modification to electronically controlled robotically operated complex systems. It encompasses working safely, applying extensive knowledge of electronic circuits and the integration to robotically operated equipment and systems, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note:

Typical circuits are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

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Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE1	Fabricate, assemble and dismantle utilities

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Prerequisite Unit(s) **4)**

02A	industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI127A	Analyse complex electronic circuits controlling fluids
UEENEEI139A	Diagnose and rectify faults in digital controls systems

Electrical Pathway Group

UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Instrumentation and Control Pathway Group

UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment

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Prerequisite Unit(s) **4)**

	manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of

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Employability Skills	**5)** competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set up electronically controlled robotically operated complex systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the work to be undertaken is determined from performance specifications and situation reports and in consultations with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.

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ELEMENT	PERFORMANCE CRITERIA	
2 Set up electronically controlled robotically operated complex systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of complex controls and integrated robot systems are applied to developing analytical solutions to machine parameters and operation.
	2.3	Parameters, specifications and performance requirements in relation to each circuit and robot device are obtained in accordance with established procedures.
	2.4	Approaches to setting up, maintenance and/or modification are carried out to provide the most effective solution.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3 Document and report on the results of the set up and actions taken.	3.1	Solutions to set up, maintenance activity and/or modification are tested to determine their effectiveness and modified where necessary.
	3.2	Set up, maintenance activity and/or modification is documented including details of all findings, calculations and assumptions.
	3.3	Set up, maintenance activity and/or modification is reported to appropriate personnel to establish suitable action to be taken based on findings.
	3.4	Justification for findings and any actions to be undertaken in relation to the work activity is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up electronically controlled robotically operated complex systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI130A	**Electronic interfacing to robotic processes**
	Evidence shall show an understanding of interfacing electronics with robot functions to an extent indicated by the following aspects:
T1	Robot types and selection and pre-selection planning
T2	Robot installation including pre-installation design, layout and system documentation
T3	Interfacing of robot controller with other external control systems
T4	Robot sensor devices, characteristics and application
T5	Diagnostic functions
T6	Maintenance scheduling and procedures
T7	Special features including safety, palletising and sub-routines

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up electronically controlled robotically operated complex systems as described in 8) and including:

A Understanding the operation of electronic and robot controls

B Forming effective strategies for analysing circuit and robot performance

C Obtaining circuit control and robot parameters,

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	specifications and performance requirements appropriate to each situation.
D	Testing the results of the analysis
E	Documenting instruction for implementing any actions resulting from the analysis that incorporates risk control measure to be followed.
F	Documenting justification of actions to be implemented in accordance with professional standards.
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to setting up electronically controlled robotically operated complex systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI129A	Set up electronically controlled mechanically operated complex systems

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to setting up electronically controlled robotically operated complex systems on at least 2 types of machines.

Note.

Typical systems are those encountered in meeting performance requirements and compliance standards, revising a machine operating parameters and dealing with machine malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Instrumentation and Control

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UEENEEI131A Set up gas analysis measuring and control instruments

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the calibration of instruments for measuring gas characteristics as it applies to the control of processes. It encompasses working safely and to standards, following set-up and calibration procedures, testing and reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set-up gas analysis measuring instruments	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Measurement parameters are identified by reviewing process requirements and instrument manufacturer's service manual.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.7	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	1.9	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
2 Set-up gas analysis measuring instruments	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular control system.
	2.3	Measuring instruments are set up and adjusted in accordance with process requirements and instrument manufacturer service manual.
	2.4	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.

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ELEMENT		PERFORMANCE CRITERIA	
		2.6	Setting-up is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3	Completion and report set-up activities	3.1	OHS risk control work completion measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Adjustment settings are documented and appropriate person(s) notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up gas analysis measuring and control instruments.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies

KS01-EI131A **Gas analysis measurement**

Evidence shall show an understanding of gas analysis to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Principle of operation of various indicators connected in remote measurement loop encompassing:

- reagent analysers (eg. Orsat),
- electrolytic,
- paramagnetic - wind- dumbbell,
- zirconia oxide,
- thermal conductivity,
- thermal reaction,
- infra-red and the like.
- Indicator calibration procedure

T2 Types of recorder used in process measurement encompassing:

- sampling and conditioning systems.
- prescribed measuring elements.
- Operation of hygrometers.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some

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circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up gas analysis measuring and control instruments as listed as described in 8) and including:

A	Identifying measurement parameters
B	Setting-up and adjusting in accordance with process requirements and instrument manufacturer's service manual
C	Documenting adjustment settings with established procedures
D	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.

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- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above, evidence should show demonstrated competency setting up gas analysis measuring and control instruments.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to setting up and adjusting two different types of gas analysis measuring instruments.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Instrumentation and Control

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UEENEEI132A Set up water analysis measuring and control instruments

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the calibration of instruments for measuring water characteristics as it applies to the control of processes. It encompasses working safely and to standards, following set-up and calibration procedures, testing and reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment

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Prerequisite Unit(s) **4)**

manuals

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set-up water analysis measuring instruments	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Measurement parameters are identified by reviewing process requirements and instrument manufacturer's service manual.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.7	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	1.9	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
2 Set-up water analysis measuring instruments	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular control system.
	2.3	Measuring instruments are set up and adjusted in accordance with process requirements and

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ELEMENT	PERFORMANCE CRITERIA	
		instrument manufacturer service manual.
	2.4	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Setting-up is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Completion and report set-up activities	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Adjustment settings are documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up water analysis measuring and control instruments.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI132A	**Water analysis measurement**
T1	Evidence shall show an understanding of water analysis to an extent indicated by the following aspects: • Terms associated with industrial water analysis equipment. • Industrial applications of specified water analysis equipment. • Principle of operation of an analyser sensor. • Principle of operation of an analyser measuring elements. • Appropriate installation requirements for specified analysers • In system checks and instrument calibration • Water analyser maintenance procedures. • Manufacturers' specifications.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1)** Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best

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utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up water analysis measuring and control instruments as listed as described in 8) and including:

A	Identifying measurement parameters
B	Setting-up and adjusting in accordance with process requirements and instrument manufacturer's service manual
C	Documenting adjustment settings with established procedures
D	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above, evidence should show demonstrated competency setting up water analysis measuring and control instruments.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge as described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to setting up and adjusting two different types of water analysis measuring instruments.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI133A Set up scientific analysis measuring and control instruments

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the calibration of instruments for measuring materials characteristics as it applies to the control of processes. It encompasses working safely and to standards, following set-up and calibration procedures, testing and reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment

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Prerequisite Unit(s) **4)**

manuals

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to set-up scientific analysis measuring instruments	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Measurement parameters are identified by reviewing process requirements and instrument manufacturer's service manual.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.7	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	1.9	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
2 Set-up scientific analysis measuring instruments	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular control system.
	2.3	Measuring instruments are set up and adjusted in accordance with process requirements and

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ELEMENT	PERFORMANCE CRITERIA	
		instrument manufacturer service manual.
	2.4	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Setting-up is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Completion and report set-up activities	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Adjustment settings are documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and setting up process measuring and control instruments for scientific analysis.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI133A	**Scientific analysis**
T1	Evidence shall show an understanding of scientific analysis to an extent indicated by the following aspects:
T2	Wavelength characteristics of the electromagnetic spectrum and radiation sources
T3	Basic principles of refraction and dispersion encompassing: • Wavelength and bandwidth of monochromatic devices. • Principle of operation of an absorption spectrometer • Principle of operation of an emission spectrometer
T4	Principle of operation of an atomic absorption spectrometer encompassing: • Principle of operation of a gas chromatography • Principle of operation of a liquid chromatography • Principles of operation of basic sample preparative instruments

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Set up scientific analysis measuring and control instruments as listed as described in 8) and including:

A Identifying measurement parameters

B Setting-up and adjusting in accordance with process requirements and instrument manufacturer's service manual

C Documenting adjustment settings with established

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procedures

D Dealing with unplanned events by drawing on the required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above, evidence should show demonstrated competency setting up process measuring and control instruments for scientific analysis.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to setting up and adjusting two different types of scientific analysis measuring instruments.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI134A Manage instrumentation and control projects

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the management of instrumentation and control projects involving design, modifications, installation, and/or maintenance of systems and equipment. The unit encompasses covers management of safety, budget variation, personnel, resources, critical path timelines and completion of documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

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Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the scope of the project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Project deliverables and budget are established from project planning and other relevant documentation and from discussions with appropriate person(s).
	1.3	Measurable outcomes are identified to evaluate the project on completion from project planning and other relevant documentation.
	1.4	Plant, materials and skills needed to meet project outcome are established from project planning and other relevant documentation.
	1.5	Processes and procedures are developed for managing contract variations from discussions with appropriate person(s) and in accordance with contractual agreement.

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ELEMENT	PERFORMANCE CRITERIA	
2 Manage project.	2.1	OHS policies, procedures and programs are implemented and monitored.
	2.2	Achievement of project outcomes is delegated to appropriately competent persons involved in the project.
	2.3	Risk events are identified and project plan strategies implemented to ensure that outcomes are achieved to the required standard of quality specified in the contract and safety required by organisation policy.
	2.4	Procurement processes and procedures are monitored to ensure on time supply of plant and materials and in accordance with organisation policy.
	2.5	Project is progress is monitored against schedule, quality requirements and budget.
	2.6	Conflict issues at the work site and between stakeholders, clients and regulators are identified and managed in accordance with organisation policy.
	2.7	Variations are managed in accordance with agreed processes and in accordance with the contract.
	2.8	Project records are maintained and progress reports written and forwarded to appropriate person(s).
3 Complete project.	3.1	Project outcomes are reviewed against original plan, implemented risk strategies, contract variations, safety record and budget.
	3.2	Project completion acceptance is sought from appropriate person(s) and handover documented in accordance with organisation policy.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and managing control projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies

KS01-EI134A	**Instrumentation and control project management**
T1	Evidence shall show an understanding of instrumentation and control project management concepts to an extent indicated by the following aspects:
T2	• Defining project parameters: Project scope; Project stakeholders and clients; Project phases and the relationship between phases; Time requirements and limitations; Resource requirements and limitations; Quality requirements and limitations.
T3	• Time management: time management concepts; standard practices for ensuring a project runs to time and the like
T4	• Financial management: Financial management concepts; Standard practices for managing project finances; Project budgets; Costs, variations and estimations; Invoicing against project phases/deliverables; Acquittals and the like.
T5	• Quality management: Quality management concepts; Standard practices for managing quality within a project.
T6	• Human Resource management: human resource management concepts; standard practices for managing personnel within a project
T7	• Communication management: Communication management concepts; Standard practices for managing communication within a project and the like.
T8	• Risk management and contingencies: risk management concepts; standard practices for managing risk within a project; Internal risks; External risks; Risk minimisation; Risk removal; Contingencies and the like.
T9	• Procurement management: procurement management concepts; standard practices for managing procurement and the like.
T10	• Physical Resource management: Types of physical resource, including; Equipment, Technology, Information, Facilities; Physical resource management concepts; Standard practices for managing physical resources

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REQUIRED SKILLS AND KNOWLEDGE

T11
- Contracts: Understanding project contracts; Standard practices for working to contract specifications; Contract format; Contract content; Legal obligations of contract parties; Accompanying documentation including; Contract Schedules and the like.

T12
- Performance assessment and continuous improvement: standard performance assessment practices; standard continuous improvement practices and the like

T13
- Engineering ethics principles

T14
- Customer/client relations encompassing:
  - Importance of customer/client relations
  - Interpersonal skills that enhance customer/client
  - Dispute resolution
  - Customer/client relations strategies

T15
- Control system industry sector customs and practices encompassing:
  - Technical aspects of project planning and management -
  - Method of ensuring equipment meets specified performance requirements
  - Performance/cost benefit analysis
  - Equipment procurement
  - Typical approaches to planning and management
  - Successful planning techniques
  - Best practice management methods and styles

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Manage control projects as described in 8) and including:

A Establishing the scope of the project accurately,

B Ascertaining the input a project

C Developing effective management processes,

D Managing resources and variations effectively

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E	Resolving conflicts
F	Adopting risk management strategies
G	Maintaining records and submitting progress reports
H	Meeting project outcomes
I	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to managing control projects.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to managing an industry accepted medium sized control project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI135A Plan instrumentation and control projects

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers development and documentation of instrumentation control project proposals, milestones and completions. The unit encompasses establishing budgets, critical path analysis, development of workflow strategies, documenting, presenting and negotiating budgets and timelines.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

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Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to plan project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established techniques for project planning are reviewed are adopted in accordance with organisation policies.
		1.3	The extent of the project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
2	Develop project plan proposal.	2.1	Estimated plant, material, labour and other costs are sought and obtained from appropriate person(s) in accordance with organisation policies and procedures.
		2.2	Project budget is established from estimated plant, material, labour and other costs in accordance with organisation policies and procedures.
		2.3	Knowledge of critical path analysis is applied

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ELEMENT	PERFORMANCE CRITERIA	
		to developing workflow strategies.
	2.4	Sources and availability of materials and human resources needed for the project are established in accordance with organisation policies and procedures.
	2.5	Risk management strategies are sought and obtained for incorporating in the project plan.
	2.6	Project plan is reviewed against all inputs and adjusted to rectify any anomalies.
	2.7	Project plan proposal is documented in accordance with organisation policies and procedures.
3 Obtain approval for project plan.	3.1	Project plan is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the project plan resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Final project plan is documented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning control projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI135A Instrumentation and control project planning

T1 Evidence shall show an understanding of instrumentation and control project planning to an extent indicated by the following aspects:

- Purpose of project planning
- Documents needed to plan a project
- Factors influencing sequence and restraints of project activities

T2 Critical path and project analysis encompassing:

- Purpose of critical path analysis
- Essential data
- Relational sequence of work activities
- Graphical representation methods
- Methods of representing time/rates
- Monitoring methods

T3 Control system industry sector customs and practices encompassing:

- Technical aspects of project planning and management
- Method of ensuring equipment meets specified performance requirements
- Performance/cost benefit analysis
- Equipment procurement
- Typical approaches to planning and management
- Successful planning techniques
- Best practice management methods and styles

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

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EVIDENCE GUIDE

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices & workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan control projects as described in 8) and including:

A Determining the project requirements accurately,

B Establishing a project budget

C Developing effective work flow strategies,

D Documenting project plan proposal

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E	Negotiating alterations to the proposed project plan successfully
F	Obtaining approval of the final plan
G	Dealing with unplanned events by drawing on the required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to planning control projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to managing an industry accepted medium sized control project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI136A Manage automated control systems projects

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the management of automated control systems projects involving design, modifications, installation, and/or maintenance of systems and equipment. The unit encompasses management of safety, budget variation, personnel, resources, critical path timelines and completion of documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

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Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the scope of the project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Project' deliverables and budget are established from project planning and other relevant documentation and from discussions with appropriate person(s).
	1.3	Measurable outcomes are identified to evaluate the project on completion from project planning and other relevant documentation.
	1.4	Plant, materials and skills needed to meet project outcome are established from project planning and other relevant documentation.
	1.5	Processes and procedures are developed for managing contract variations from discussions with appropriate person(s) and in accordance with contractual agreement.

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ELEMENT	PERFORMANCE CRITERIA	
2 Manage project.	2.1	OHS policies, procedures and programs are implemented and monitored.
	2.2	Achievement of project outcomes is delegated to appropriately competent persons involved in the project.
	2.3	Risk events are identified and project plan strategies implemented to ensure that outcomes are achieved to the required standard of quality specified in the contract and safety required by organisation policy.
	2.4	Procurement processes and procedures are monitored to ensure on time supply of plant and materials and in accordance with organisation policy.
	2.5	Project is progress is monitored against schedule, quality requirements and budget.
	2.6	Conflict issues at the work site and between stakeholders, clients and regulators are identified and managed in accordance with organisation policy.
	2.7	Variations are managed in accordance with agreed processes and in accordance with the contract.
	2.8	Project records are maintained and progress reports written and forwarded to all appropriate person(s).
3 Complete project.	3.1	Project outcomes are reviewed against original plan, implemented risk strategies, contract variations, safety record and budget.
	3.2	Project completion acceptance is sought from appropriate person(s) and hand-over documented in accordance with organisation policy.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and managing automated systems projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI136A Automation and control project management

T1 Evidence shall show an understanding of automation and control project management concepts to an extent indicated by the following aspects:

- Defining project parameters: Project scope;
- Project stakeholders and clients;
- Project phases and the relationship between phases;
- Time requirements and limitations;
- Resource requirements and limitations;
- Quality requirements and limitations.

T2 Time management:

- Time management concepts;
- Standard practices for ensuring a project runs to time and the like.

T3 Financial management:

- Financial management concepts;
- Standard practices for managing project finances;
- Project budgets;
- Costs, variations and estimations;
- Invoicing against project phases/deliverables;
- Acquittals and the like.

T4 Quality management:

- Quality management concepts;
- Standard practices for managing quality within a project.

T5 Human Resource management:

- human resource management concepts;
- standard practices for managing personnel within a project

T6 Communication management:

- Communication management concepts;
- Standard practices for managing communication within a project and the like.

T7 Risk management and contingencies:

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REQUIRED SKILLS AND KNOWLEDGE

- risk management concepts;
- standard practices for managing risk within a project;
- Internal risks;
- External risks;
- Risk minimisation;
- Risk removal;
- Contingencies and the like.

T8 Procurement management:

- procurement management concepts;
- standard practices for managing procurement and the like.

T9 Physical Resource management:

- Types of physical resource, including;
- Equipment, Technology, Information, Facilities;
- Physical resource management concepts;
- Standard practices for managing physical resources

T10 Contracts:

- Understanding project contracts;
- Standard practices for working to contract specifications;
- Contract format;
- Contract content;
- Legal obligations of contract parties;
- Accompanying documentation including;
- Contract Schedules and the like.

T11 Performance assessment and continuous improvement:

- standard performance assessment practices;
- standard continuous improvement practices and the like
- Engineering ethics principles

T12 Customer/client relations encompassing:

- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T13 Automated systems industry sector customs and practices encompassing:

- Technical aspects of project planning and management
- Method of ensuring equipment meets specified performance requirements
- Performance/cost benefit analysis
- Equipment procurement

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REQUIRED SKILLS AND KNOWLEDGE

- Typical approaches to planning and management
- Successful planning techniques
- Best practice management methods and styles

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence

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how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Manage automated systems projects as described in 8) and

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including:

A	Establishing the scope of the project accurately,
B	Ascertaining the input a project
C	Developing effective management processes,
D	Managing resources and variations effectively
E	Resolving conflicts
F	Adopting risk management strategies
G	Maintaining records and submitting progress reports
H	Meeting project outcomes
I	Dealing with unplanned events by drawing on required knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved

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industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to managing automated systems projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to managing an industry accepted medium sized automated systems project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI137A Plan automated and control systems projects

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers development and documentation of automated and control systems project proposals, milestones and completions. The unit encompasses establishing budgets, critical path analysis, development of workflow strategies, documenting, presenting and negotiating budgets and timelines.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

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Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to plan project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established techniques for project planning are reviewed are adopted in accordance with organisation policies.
	1.3	The extent of the project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
2 Develop project plan proposal.	2.1	Estimated plant, material, labour and other costs are sought and obtained from appropriate person(s) in accordance with organisation policies and procedures.
	2.2	Project budget is established from estimated plant, material, labour and other costs in accordance with organisation policies and procedures.
	2.3	Knowledge of critical path analysis is applied to developing workflow strategies.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Sources and availability of materials and human resources needed for the project are established in accordance with organisation policies and procedures.
	2.5	Risk management strategies are sought and obtained for incorporating in the project plan.
	2.6	Project plan is reviewed against all inputs and adjusted to rectify any anomalies.
	2.7	Project plan proposal is documented in accordance with organisation policies and procedures.
3 Obtain approval for project plan.	3.1	Project plan is presented and discussed with person(s) of higher authority.
	3.2	Alterations to the project plan resulting from the presentation/discussion are negotiated with person(s) of higher authority within the constraints of organisation policy.
	3.3	Final project plan is documented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning automated systems projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI137A Automation and control project planning

T1 Evidence shall show an understanding of automation and control project planning to an extent indicated by the following aspects:

- Purpose of project planning
- Documents needed to plan a project
- Factors influencing sequence and restraints of project activities

T2 Critical path and project analysis encompassing:

- Purpose of critical path analysis
- Essential data
- Relational sequence of work activities
- Graphical representation methods
- Methods of representing time/rates
- Monitoring methods

T3 automation and control industry sector customs and practices encompassing:

- Technical aspects of project planning and management
- Method of ensuring equipment meets specified performance requirements
- Performance/cost benefit analysis
- Equipment procurement
- Typical approaches to planning and management
- Successful planning techniques
- Best practice management methods and styles

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan automated systems projects as described in 8) and including:

A Determining the project requirements accurately,

B Establishing a project budget

C Developing effective work flow strategies,

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D	Documenting project plan proposal
E	Negotiating alterations to the proposed project plan successfully
F	Obtaining approval of the final plan
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit must be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to planning automated systems projects.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to managing an industry accepted medium sized automated systems project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI138A Provide solutions to extra low voltage (ELV) electro-pneumatic control systems and drives

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing and implementing control solutions for systems using electro-pneumatic elements operating at extra-low voltage and variable speed drives. It encompasses safe working practices, establishing required control functions, checking device installation, entering instruction into programmable devices, following written and oral instruction and procedures and completing necessary documentation.

Note:

Electrical connections referred to in this unit are confined to pre-assembled plug and socket sets. This unit does not cover competencies for installation and connection of electrical wiring.

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Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment previously acquired competencies.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title

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Prerequisite Unit(s) **4)**

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to developing solutions.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The functions that the control and drive system is required to perform is established and documented from instruction from work supervisor or customer.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Provide solutions.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	The circuits for the electro-pneumatic control and drive system are developed to meet the required functions and documented.
	2.4	Locations of control field devices are checked and adjusted to ensure they function correctly.
	2.5	The circuits for the electro-pneumatic control and drive system component connections are checked against the developed circuits
	2.6	The required functioning of the systems is entering into programmable components and parameters set in accordance with developed circuit and manufacturer programming

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ELEMENT	PERFORMANCE CRITERIA	
		instructions.
3 Test and document solutions.	3.1	Operation of the electro-pneumatic control and drive system is tested in strict accordance OHS requirements and procedures.
	3.2	Operating anomalies are identified and corrected in accordance with established procedures.
	3.3	OHS work completion risk control measures and procedures are followed.
	3.4	Work site is cleaned and made safe in accordance with established procedures.
	3.5	Work completion is reported and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and entering and verifying operating instruction in basic microprocessor equipped devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI138A Electrical and pneumatic control fundamentals

Evidence shall show an understanding of electrical and pneumatic control fundamentals to an extent indicated by the following aspects:

T1 Electrical and pneumatic safety encompassing:

- Hazardous and safe working methods and procedures
- Pneumatic operating pressures
- Isolation procedures

T2 Electrical/pneumatic drawing types and applications encompassing:

- Drawing layouts and conventions (electrical and pneumatic schematics, wiring and piping diagrams)
- Drawing symbols

T3 Electrical and pneumatic control system components

Electrical components include power, HMIs, relays, plug and socket connectors; Pneumatic components include air supply systems, HMIs, valves, actuators, tubing and connectors.

T5 Electrical relay types encompassing:

- Operation
- Contact configurations

T6 Pneumatic control valves and actuators encompassing:

- Types and their operation
- Activated and deactivated configurations

T6 Basic logic as applied to control systems

Logic confined to AND, OR, NOT and NOR functions

KS02-EI138A Variable speed drive (VSD) functions and configuration

T1 Evidence shall show an understanding of variable speed drive (VSD) functions and set up to an extent indicated by the following aspects:

T2 Basic function of a variable speed drive in controlling an induction motor.

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REQUIRED SKILLS AND KNOWLEDGE

T3 Configuring a variable speed drive encompassing:

T4 Configuration includes setting rated motor voltage and current, digital and analogue inputs, speed range, ramp times and the like.

T6 Testing procedures

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to

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be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the ‘Assessment Guidelines – UEE11’. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

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- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Enter and verify operating instructions in microprocessor equipped devices as described in 8) and including:

A	Establishing and documenting functions that the control and drive system is required to perform
B	Developing and documenting circuits for the electro-pneumatic control and drive systems that meet the required functions.
C	Checking location of control field devices and adjusting to ensure correct functioning.
D	Checking electro-pneumatic control and drive system components connections
E	Entering functions and parameters into programmable components correctly
F	Correcting programming anomalies.
G	Testing and verifying correct operation.
H	Reporting work completion to appropriate persons in accordance with established procedures
I	Dealing with unplanned events.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

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These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to provide solutions to ELV electro-pneumatic control systems and drives.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

An electro-pneumatic control system that includes:

- a drive system with VSD;
- programmable controller,
- proximity detection devices,
- operational indicators,
- electro-pneumatic control valves,
- actuators.

with emergency stop and stop/reset function and at least three of the following functions;

- Accelerating drive to set speed when started
- Decelerating drive when stopped
- Rejection/acceptance
- Counting
- Operation indication

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI139A Diagnose and rectify faults in digital controls systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	
2	Edit	N/A	Inserted topic numbering in Required Skills and Knowledge	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers diagnosing and rectifying faults in digital components of electronic control systems. The unit encompasses safe working practices, interpreting diagrams and technical data, applying knowledge of digital systems to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Instrumentation and Control

Electrical

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Prerequisite Unit(s) **4)**

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Instrumentation and Control Pathway Group

Unit Code	Unit Title
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

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Prerequisite Unit(s) **4)**

Electrical Pathway Group

Unit Code	Unit Title
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct

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ELEMENT	PERFORMANCE CRITERIA	
		operation and safety.
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose electronic control system apparatus faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the cause(s) of system fault.
	2.6	Cause of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the digital subsystems.
	2.7	Faults in the electronic components of the system are rectified to raise apparatus and system to its operational standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable

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ELEMENT	PERFORMANCE CRITERIA	
		energy practices.
3 Complete and report fault diagnosis and rectification activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in digital control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI139ADigital electronic control systems

Evidence shall show an understanding of digital electronic control systems to an extent indicated by the following aspects:

T1. Digital control systems

- Comparison between analogue and digital signals
- Advantages of digital control systems
- Digital/analog control system
- Logic gates
- Truth tables
- Digital testing devices

T2. Numbering systems

- The binary number system
- The Octal number system
- The hexadecimal number system
- Binary addition and subtraction
- Conversion between numbering systems
- Binary Coded Decimal (BCD)
- Gray code
- The American Standard Code for Information Interchange (ASCII)

T3. Combinational Logic Networks

- Precautions when handling electronic devices due to electrostatic discharge (ESD)
- Truth tables
- Basic operation and characteristics of logic devices
- Logic probes
- Verification of operation of logic circuits

T4. Logic families and specifications

- Transistor-Transistor Logic (TTL)
- Complementary Metal Oxide Silicone (CMOS) logic families
- the ‘unit load’ concept
- specifications and features of TTL, TTL low power Schottky (LS) and CMOS

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REQUIRED SKILLS AND KNOWLEDGE

logic families.

- three state and open collector logic
- input and output voltage characteristics for CMOS and TTL
- comparison of TTL with CMOS logic families
- Unit load
- noise margin
- interfacing different logic families
- Tri-state logic devices

T5. Encoders and Decoders

- weighted and unweighted codes.
- Gray
- BCD
- ASCII
- Half and full adder
- Encoders, decoders
- error detection.
- decoder and encoder ICs.
- multiplexer and demultiplexer ICs.

T6. Flipflops

- RS flipflops
- D flipflops
- JK flipflops
- truth tables and operation
- debouncing a switch
- timing diagrams
- Sequential logic
- State tables and timing diagrams

T7. Registers

- shift registers
- data latches

T8. Counters

- ripple counters using JK flipflops
- typical IC types
- characteristics and operation.
- Ripple counters
- Use of feedback to modify count
- Circuit verification of a ripple counter
- Synchronous counters

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REQUIRED SKILLS AND KNOWLEDGE

- Series and parallel data transfer
- Multivibrators
- Interconnecting digital circuits to perform an application

T9. Digital to analog conversion

- Industrial applications of D/A converters
- Summing D/A converters
- R-2R D/A converters
- Verification of circuit operation of an IC D/A converter

T10. Analog to digital conversion

- Industrial applications of A/D converters
- Digital ramp, dual slope, successive approximation and simultaneous (flash) A/D converters.
- Verification of circuit operation of an IC A/D converters

T11. Display devices

- Liquid Crystal Display (LCD) devices
- Light Emitting Diode (LED) devices.
- Operation and Characteristics.
- Seven segment LED displays
- Drive requirements
- Current limiting
- Multiplexed displays
- Seven segment encoding chips
- Emerging display technologies

T12. Digital fault finding

- General fault finding principles
- Common digital faults
- Digital test equipment
- Locating a fault

T13. Interfacing logic devices to external loads

- Interfacing with a transistor
- Interfacing with a relay
- Solid state switches
- Opto-isolator
- Verification of circuit operation of an opto-coupler.

T14. Programmable logic devices

- Applications of programmable logic devices
- Types of programmable logic devices

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REQUIRED SKILLS AND KNOWLEDGE

- Comparison between different programmable logic devices
- Programmable Array Logic (PAL)
- Programmable Logic Devices (PLD)
- Field Programmable Gate Arrays (FPGA)
- Programming and verifying correct operation of a programmable array logic device

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries

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risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in digital subsystems of electronic controls as described in 8) and including:

A Applying logical diagnostic methods.

B Using fault scenarios to test the cause(s) of system faults.

C Identifying faults and their cause and competency needed to rectify them.

D Rectifying faults in system digital subsystems.

E Verifying that the system operates correctly.

F Documenting fault rectification.

G Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment,

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conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in digital systems of electronic controls.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified required skills and knowledge are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by diagnosing and rectifying at least four of the following faults in digital control systems.

- Open-circuit
- Short-circuit
- Incorrect or failed connections
- Insulation failure
- Unsafe condition
- Apparatus/component failure
- Related mechanical failure

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI140A Plan the electrical installation of integrated systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the planning and practices in installing an integrated systems. It encompasses working safely, applying knowledge bus system parameters, topology and installation requirements, bus system cables and terminations, control and dimming methods and planning and documenting integrated installation plans.

Application of the Unit

Application of the Unit

2)

This unit is intended as an elective or skill set at AQF 3 level. competencies. It is suitable for employment-based programs under an approved contract of training and may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However the skills and knowledge as they apply to working directly on the associated electrical power wiring and equipment require a licence to practise in the workplace where the operating voltage is above 50 V a.c. or 120 V d.c. subject to regulations to carry out electrical work. Practice in the workplace and during training is subject to occupational health and safety regulations and codes and obligations of a ‘contracts of training’ such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrotechnology

Electrical

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment

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Prerequisite Unit(s) **4)**

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Electrotechnology Pathway Group

Unit Code	Unit Title
UEENEEE108A	Lay wiring/cabling and terminate accessories for ELV circuits

Electrical Pathway Group

Unit Code	Unit Title
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Establish integrated system scenario	1.1	Customer requirements for scenes, events and controls in the integrated system are established from job specifications and discussion with appropriate persons
		1.2	The types and location of integrated system loads are determined from job specifications and customer requirements.
		1.3	Types and location of control (input) devices of integrated system are determining from job specifications and customer requirements.
		1.4	Budget for the integrated system is established from customer requirements and discussion with appropriate persons.
2	Plan integrated system	2.1	OHS procedures and risk control work measures are followed.
		2.2	Knowledge of integrated system devices and their capabilities is applied in the plan.
		2.3	Number and types of output devices to suit the established scenario are chosen for compatibility with the system loads
		2.4	Number and types of control (input) devices to suit the established system scenario are chosen.
		2.5	Integrated systems are planned to comply with bus system and supply voltage parameters.
		2.6	Other control methods are considered in planning the integrated system plan.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Integrated systems are planned within the given budget.
	2.8	Final plan is documented and submitted to an appropriate person for approval. Note. Documentation includes explanations of how the customers' requirement will be achieved; a material list with costs and a marked up floor plan showing relationship of load groups to input devices.
3 Implement an integrated system installation plan	3.1	OHS risk control work measures and procedures are followed.
	3.2	Integrated systems are arranged using an acceptable topology.
	3.3	A connection chart/diagram between all device in the integrated system is developed
	3.4	Appropriate cable for the bus system is selected and connected at devices and accessories using the methods and the polarity specified by the manufacturer.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge and associated skills for planning installations of integrated systems have been acquired.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI140A Integrated systems installation requirements

Evidence shall show an understanding of integrated systems installation requirements to an extent indicated by the following aspects:

T1 Bus system parameters encompassing:

- How bus systems work
- Network topology
- Voltage and current limits
- Cable type and length limits
- Network impedance
- Network and device status indication

T2 LV supply voltage parameters and quality.

- Supply sources such as UPS and inverters may adversely effect voltage parameters and waveform.

T3 Cabling encompassing:

- Insulation resistance testing precautions and prohibitions
- LV cable terminations and conductor size
- Bus cable polarity and pairing
- Bus cable termination requirements and techniques
- Field and enclosure segregation requirements (Segregation is required by both AS/NZS 3000 and AS/ACIF S009).

T4 Supply and load protection encompassing:

- Conductors and protection device co-ordination (AS/NZS 3000:2007 Clause 2.5.3.1)
- Use of residual current devices
- Protection on supply and load side of system devices (IEC 60669-2-1 protection requirements).

T5 Output devices encompassing:

- Relays connections for ELV and LV loads
- Dimmer types
- Supply and load connections for the various dimmer types

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REQUIRED SKILLS AND KNOWLEDGE

T6 Installation requirements for input devices encompassing:

- Passive infrared detectors
- Light level control
- Key inputs
- Touch screens

T7 Acceptable and unacceptable topologies for a single network

T8 Devices and connections for other control methods encompassing:

- DSI (Distributed Signaling Interface) Gateway dimming and control
- Devices and connections DALI (Digital Addressable Lighting Interface) dimming and control
- Zero to 10 volts analogue control.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

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various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by

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some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Planning and implementing integrated systems as described in 8) and including:

A	Establishing customer requirements for integrated system.
B	Determining system components and locations from job specifications and customer requirements.
C	Ensuring that the power source for the integrated system is suitable
D	Choosing integrated system component for compatibility with loads and established scenarios
E	Planning integrated systems to comply with bus system and supply voltage parameters
F	Considering other control methods in planning the integrated system
G	Keeping within a given budget
H	Documenting integrated system plan
I	Arranging an integrated system using an acceptable topology
J	Developing a connection chart/diagram
K	Selecting and terminating bus cable using specified methods and polarity.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to plan the installation of integrated systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified required skills and knowledge are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to three integrated systems one of which has at least 4 separate scenes and 5 control requirements.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI141A Develop electrical integrated systems

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the development of integrated systems. It encompasses working safely, scrutinising and adapting project specifications, applying knowledge of the application for integrated systems, system topologies and devices applications and capabilities, system programming methods, using diagnostic tools and documenting the developed systems.

Application of the Unit

Application of the Unit

2)

This unit is intended as an elective or skill set at AQF 3 level. It is suitable for employment-based programs under an approved contract of training and may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However the skills and knowledge as they apply to working directly on the associated electrical power wiring and equipment require a licence to practise in the workplace where the operating voltage is above 50 V a.c. or 120 V d.c. subject to regulations to carry out electrical work. Practice in the workplace and during training is subject to occupational health and safety regulations and codes and obligation of 'contracts of training' such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrotechnology

Electrical

Common Unit Group

Unit Code	Unit Title
UEENEED101A	Use computer applications relevant to a workplace
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **4)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

Electrotechnology Pathway Group

Unit Code	Unit Title
UEENEEE108A	Lay wiring/cabling and terminate accessories for ELV circuits

Electrical Pathway Group

Unit Code	Unit Title
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop an integrated system	1.1	The types and location of loads and control devices is determined from project specifications and customer requirements.
	1.2	The number of control bus networks and current requirements are determined from load calculations for devices on the system.
	1.3	Appropriate placement of system devices in the system scheme is determined from bus network power and load parameters and to maintain system stability.
	1.4	The integrated system is developed to comply with regulator, safety and manufacturer's requirements.
	1.5	A take-off of the number of devices and accessories required for the system is documented using manufacturer's title and ID for each.
	1.6	Programming and diagnostic tools needed for the project are down loaded to a compatible PC and checked for correct operation and safety.
2 Program integrated system devices	2.1	OHS risk control work measures and procedures are followed.
	2.2	Modes of programming are applied to developing the integrated system in accordance with manufacturers and

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ELEMENT	PERFORMANCE CRITERIA	
		programming software instructions.
	2.3	Manufacturer's instructions and recommendations are followed in programming system devices to project requirements.
	2.4	Parameters for operation of loads are programmed to project requirements and within manufacturer's designated range.
	2.5	The programmed system data base is saved and backed up in accordance with manufacturer's instructions.
3 Load and test integrated system	3.1	OHS risk control work measures and procedures are followed.
	3.2	Data base of integrated system program is transferred to the network.
	3.3	All functions of the integrated system are tested for compliance with project requirements and manufacturer's specifications.
	3.4	Diagnostic tools are used to locate any system faults, defects or anomalies.
	3.5	Defects or anomalies are corrected to comply with project requirements and manufacturer's specifications.
	3.6	A copy of the documentation of integrated system is given the client or client's representative.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge and associated skills of integrated systems have been acquired.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI141A Integrated systems operating parameters and programming

Evidence shall show an understanding of integrated systems operating parameters and programming to an extent indicated by the following aspects:

T1 Applications and advantages of integrated systems

T2 System components encompassing:

- Support devices for control bus supply and control
- Support devices for programming, interconnection between networks and integration with third party systems.
- Types and capabilities of output devices.
- Lighting dimmer capabilities and selection
- Controlling DSI and communicating with DALI electronic ballasts
- Types and capabilities of input devices

T3 Network specifications encompassing:

- Bus system cable type, polarity, length and acceptable topologies.
- Importance of the location of output and input devices and control bus power supplies
- Ensuring control bus stability (stability can be effected by number of units on a network, current drawn by devices in relation to current output of power supplies).
- Multiple network connectivity
- LV supply overcurrent and surge protection.

T4 Software for system and device programming, monitoring and controlling

T5 System and device programming encompassing:

- Addressing conventions for networks, devices, applications, output groups, types of control and outputs (Output include ‘on’, ‘off”, a specific level, over a specific time and the like).
- PC programming tools and methods (programming includes configuring network data base using addressing tools and objects, function objects, editing, altering and transferring the data base to network)
- Importance of project documentation and backup

T6 System fault-finding processes

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REQUIRED SKILLS AND KNOWLEDGE

- Fault-finding includes the use of multimeters, oscilloscope, system analysers and diagnostic software.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered

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will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

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A	Determining the types and location of loads and control devices
B	Using load calculations to correctly determine the number of network and current requirements.
C	Placing system devices appropriately in the system scheme.
D	Checking programming and diagnostic tools
E	Applying appropriate modes of programming to develop the integrated system.
F	Following manufacturer's instruction and recommendations in programming devices and setting load operating parameters.
G	Developing integrated system to comply with regulator, safety and project requirements.
H	Down loading program to network successfully
I	Using diagnostic tools to locate and correct any system defects, faults and anomalies
K	Documenting and (backing up) integrated system at development at the preparation, programming and completion of the project.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible

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reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to integrated systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified required skills and knowledge are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- Developing an integrated system including at least 6 of the following functions:
- Direct Load Control
- Two Way Switching
- Multiple Load Control
- Energy Saving On Dimmers
- Panic Button
- Scenes
- Typical Master Bedroom
- PIR Enable/Disable
- Light Level Maintenance
- Corridor Linking
- Restrike Delays
- Using more than one programming mode
- Transferring a program data base to a network and testing functionality.
- Finding at least 5 hardware and 5 software faults

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI142A Develop an electrical integrated system interface for access through a touch screen

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the development of integrated systems touch screen interface. It encompasses working safely, applying knowledge of the application integrated system, working with customers to determine required control parameters, application of touch screen software components and embellishments, network connectivity, using diagnostic tools and documenting the developed systems.

Application of the Unit

Application of the Unit

2)

This unit is intended as an elective or skill set at AQF 4 level. It is suitable for employment-based programs under an approved contract of training and may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However the skills and knowledge as they apply to working directly on the associated electrical power wiring and equipment require a licence to practise in the workplace where the operating voltage is above 50 V a.c. or 120 V d.c. subject to regulations to carry out electrical work. Practice in the workplace and during training is subject to occupational health and safety regulations and codes and obligation of 'contracts of training' such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrotechnology

Electrical

Common Unit Group

Unit Code	Unit Title
UEENEED101A	Use computer applications relevant to a workplace
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **4)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI141A	Develop electrical integrated systems

Electrotechnology Pathway Group

Unit Code	Unit Title
UEENEEE108A	Lay wiring/cabling and terminate accessories for ELV circuits

Electrical Pathway Group

Unit Code	Unit Title
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills	**5)**
	will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop and integrated system touch screen interface	1.1	The areas and control to be accessed through the touch screen are determined from the integrated systems data base and customer requirements.
		1.2	Control parameters to be accessed through the touch screen are determined from the integrated systems data base and confirmed with the customer.
		1.3	Touch screen embellishments to be applied are discussed and confirmed with the customer.
		1.4	Touch screen programming and integrated system programming software and project data are down loaded to a compatible PC.
		1.5	Programming tools are and checked for correct operation.
		1.6	Manufacturer’s instruction for installing and connecting touch screens are read and understood
2	Develop and integrated system touch screen	2.1	OHS risk control work measures and procedures are followed.
		2.2	Installation and connection for the touch

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ELEMENT		PERFORMANCE CRITERIA	
	interface		screen are checked for compliance with manufacture's requirements.
		2.3	Knowledge of integrated system and touch screen programming methods are used in developing a touch screen interface.
		2.4	Touch screen interface functions and embellishments are developed for compatibly with the integrated system and to customer requirements
		2.5	Network connectivity is implemented, where required, and web page content made available.
3	Back up, transfer and test touch screen interface	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Touch screen interface program is backed up and transfer to the touch screen following manufacturer's instructions.
		3.3	Touch screen tests are conducted to verify compatibility and compliance with the integrated system and customer requirements.
		3.4	Non-compliance operations and anomalies are corrected to comply with manufacturer's and customer requirements.
		3.5	A copy of the documentation of the as-programmed touch screen specifications is given the client or client's representative.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge and associated skills for developing an integrated system interface for access through a touch screen have been acquired.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI142A Touch screen installation requirements and programming in integrated systems

Evidence shall show an understanding of the installation requirements and programming of touch screens in integrated systems to an extent indicated by the following aspects:

T1 Integrated system touch screen types, features and parameters.

T2 Touch screen mounting methods and manufacturer's instructions

T3 Touch screen wiring and connection arrangements encompassing:

- Power supply
- Integrated network
- Audio
- Video
- IR control
- Programming
- Network

T4 Electrical protection requirements

T5 Programming requirements and process

T6 Programming software specifications and tools

T7 HMI programming techniques with proprietary software encompassing

- Component types
- Component properties
- Arranging visible properties and creating screen embellishment
- Setting integrated system properties of components (components can be text, images, shapes, buttons, sliders, level indicators, clocks, monitors, HTML, web cam images and the like).

T8 Methods for transferring and project data and backing up.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

A Determining the areas and control parameters to be accessed through the touch screen

B Confirming touch screen embellishments to be applied

C Down loading to a PC and checking touch screen programming and integrated system programming software and project data.

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D	Understanding manufacturer's instruction for installing and connecting touch screens
E	Checking that the installation and connections for the touch screen comply with manufacture's requirements.
F	Developing touch screen interface functions and embellishments in accordance for compatibility with the integrated system and to customer requirements
G	Backing up and transferring touch screen interface program following manufacturer's instructions.
H	Testing touch screen and correcting non-compliance operations and anomalies.
I	Documenting the as-programmed touch screen specifications

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified required skills and knowledge are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to using manufacturer's designated software to:

- program a B/W touch screen for safe and effective operation.
- create and edit scenes, schedules and access control
- use templates to enhance a touch screen
- backup and restore program
- transfer the programmed access to a touch screen in an integrated system

and

- program a colour touch screen for safe and effective operation.
- create and edit scenes, schedules and access control
- use templates to enhance a touch screen
- backup and restore program
- transfer the programmed access to a colour touch screen in an integrated system

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI143A Develop access control of electrical integrated systems using logic-based programming tools

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Show full pre-req chain in the unit	
2	Edit	N/A	Replaced "essential knowledge and associated skills" with "required skills and knowledge"	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers programming functions and parameters of touch screens and other access controls in an integrated system. It encompasses working safely and to manufacturer's instructions and regulatory requirements, applying knowledge of the application integrated system, using proprietary touch screen programming tools, and documenting as-programmed assess functions.

Application of the Unit

Application of the Unit

2)

This unit is intended as an elective or skill set at AQF 4 level. It may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit requires a license to practice in the workplace where plant and equipment is directly connected to installation wiring that operates at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrotechnology

Electrical

Common Unit Group

Unit Code	Unit Title
UEENEED101A	Use computer applications relevant to a workplace
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **4)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI141A	Develop electrical integrated systems
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen

Electrotechnology Pathway Group

Unit Code	Unit Title
UEENEEE108A	Lay wiring/cabling and terminate accessories for ELV circuits

Electrical Pathway Group

Unit Code	Unit Title
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of

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Employability Skills	**5)** competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to program integrated system access control	1.1	The functions of integrated system access is determined from the systems data base and customer requirements.
		1.2	Control parameters are determined from the integrated systems data base and confirmed with the customer.
		1.3	Programming software tools and project data are down loaded to a compatible PC and checked.
		1.4	Manufacturer’s instruction for installing and connecting internet connectivity equipment are read and understood.
2	Program integrated system access control	2.1	OHS risk control work measures and procedures are followed.
		2.2	Knowledge of integrated system logic-based programming methods are used in programming access control.
		2.3	Integrated system functions and parameters are programmed for compatibly with the integrated system and to customer requirements

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ELEMENT		PERFORMANCE CRITERIA	
		2.4	Network connectivity is implemented in accordance with manufacturer's instruction and regulatory requirements.
3	Back up, transfer and test system access control	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Programmed functions and parameters are backed up and transfer to the system following manufacturer's instructions.
		3.3	System access tests are conducted to verify compatibility and compliance with the integrated system and customer requirements.
		3.4	Non-compliance operations and anomalies are corrected to comply with manufacturer's and customer requirements.
		3.5	A copy of the documentation of the as-programmed access specifications is given the client or client's representative.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge and associated skills for developing access control of integrated systems using logic-based programming tools have been acquired.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI143A Logic-based programming for integrated systems

Evidence shall show an understanding of logic-based programming for integrated systems to an extent indicated by the following aspects:

T1 Integrated system hardware parameters and limitations

T2 Integrated system configuration software features and options.

Features include touch screen colours, file management, file import and export.

T3 Logic gates as they apply in integrated system control

T4 Logic-based software tools encompassing:

- Functions, actions, variables and limitations
- Basic code syntax
- Compiling and editing
- Exporting and archiving
- Monitoring usage

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Programming integrated system controllers using logic-based programming tools as described in 8) and including:

A Determining the functions and parameters of the integrated system

B Down loading a PC and checking software tools and integrated system programming software and project data.

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C	Checking that network equipment and connectivity comply with manufacture's requirements.
D	Developing integrated system functions and parameters in accordance for compatibility with the integrated system and to customer requirements
E	Backing up and transferring programmed functions and parameters following manufacturer's instructions.
F	Testing access and correcting non-compliance operations and anomalies.
G	Documenting the as-programmed access control specifications.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing access control of integrated systems using logic-based programming tools.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3

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'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified required skills and knowledge are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to programming integrated system access using logic-based programming tools with at least the following functions:

- Selectors
- Room Joining
- Counters and Drawing
- Logic Timer
- Run On Timer
- Corridor Linking
- Scene Storing
- System I/O Scheduling
- After Hours
- Enable / Disable functions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI144A Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system

Modification History

		UEENEEI144A	Develop interfaces for multiple access methods to monitor, schedule and control an electrical integrated system	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	In Unit Descriptor, correct the spelling mistake.	
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers programming for multiple access to integrated systems for a single dwelling. Such access includes mobile phones, computer networks, remote controls, touch screens and the like. It encompasses working safely and to manufacturer’s instructions and regulatory requirements, installing and setting up gateway equipment, applying knowledge of the application of integrated system including remote reprogramming and monitoring, using proprietary programming tools, and documenting as-programmed access functions.

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Application of the Unit

Application of the Unit **2)**

This unit is intended as an elective or skill set at AQF 4 level. It may be aligned with a vendor training program that is shown to have the same competency outcomes as this unit.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However the skills and knowledge as they apply to working directly on the associated electrical power wiring and equipment require a licence to practise in the workplace where the operating voltage is above 50 V a.c. or 120 V d.c. subject to regulations to carry out electrical work. Practice in the workplace and during training is subject to occupational health and safety regulations and codes and obligation of ‘contracts of training’ such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrotechnology

Electrical

Common Unit Group

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Prerequisite Unit(s)

4)

Unit Code	Unit Title
UEENEED101A	Use computer applications relevant to a workplace
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI141A	Develop electrical integrated systems
UEENEEI142A	Develop an electrical integrated system interface for access through a touch screen.

Electrotechnology Pathway Group

Unit Code	Unit Title
UEENEEE108A	Lay wiring/cabling and terminate accessories for ELV circuits

Electrical Pathway Group

Unit Code	Unit Title
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop an interfaces for multiple access methods of integrated system	1.1	The extent of the various services in the integrated system determined from the systems data base and customer requirements.
		1.2	Control parameters are determined from the integrated systems data base and confirmed with the customer.
		1.3	Programming software tools and project data are down loaded to a compatible PC and checked
		1.4	Manufacturer’s instruction for installing and connecting gateway equipment are read and understood.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop an interface for multiple access of integrated systems	2.1	OHS risk control work measures and procedures are followed.
	2.2	Knowledge of IT network accessing integrated system programming methods are used in programming multiple access control.
	2.3	Functions and parameters of integrated system services are programmed in accordance with manufacturer's instruction and to customer requirements.
	2.4	Gateway equipment installation and connectivity is implemented in accordance with manufacturer's instruction and regulatory requirements.
3 Back up, transfer and test system access	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Programmed access, functions and parameters are backed up and transfer to the system following manufacturer's instructions.
	3.3	Programmed access methods tests are conducted to verify compatibility and compliance with the integrated system and customer requirements.
	3.4	Non-compliance operations and anomalies are corrected to comply with manufacturer's and customer requirements.
	3.5	A copy of the documentation of the as-programmed multiple access specifications are given the client or client's representative.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge and associated skills for developing interfaces for multiple access methods to monitor, schedule and control an integrated system have been acquired.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI144A Multiple access to integrated systems programming

Evidence shall show an understanding of multiple access to integrated systems programming to an extent indicated by the following aspects:

T1 Gateway devices encompassing:

- Component
- Installation requirements
- Regulatory requirements

T2 Network set up encompassing:

- Terminology
- Network options
- Ethernet connectivity
- Wireless connectivity
- Router configuration

T3 Controller user interface

T4 Programming software and application

- Confined to proprietary software such as ‘wizards’, icons and widgets.

T5 Interface web browsers

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

A	Determining extent of the various services and functions and parameters of the integrated system
B	Down loading a PC and checking software tools and integrated system programming software and project data.
C	Checking that network equipment and connectivity

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	comply with manufacture's requirements.
D	Developing integrated system multiple access with manufacturer's instruction and to customer requirements.
E	Backing up and transferring programmed assess functions and parameters following manufacturer's instructions.
F	Testing multiple access and correcting non-compliance operations and anomalies.
G	Documenting the as-programmed access control specifications.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing interfaces for multiple access methods to monitor, schedule and control an integrated system.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified required skills and knowledge are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing interfaces and program to monitor, schedule and control an integrated system by the following access methods

- Mobile phone
- Computer
- Touch screen
- Remote controller
- Manual input devices

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI145A Diagnose and rectify faults in a.c. motor drive systems

Modification History

		UEENEEI145A	Diagnose and rectify faults in a.c. motor drive systems	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers diagnosing and rectifying faults in systems controlling starting, speed, torque, power output, efficient running and braking of a.c. motors. The unit encompasses safe working practices, interpreting technical data, applying knowledge of a.c motors operating parameters to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved

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contract of training at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the

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Prerequisite Unit(s) **4)**

	workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI148A	Solve problems in single phase electronic power control circuits
UEENEEI149A	Solve problems in polyphase electronic power control circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to diagnose and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
		1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose a.c. motor control system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Causes of the faults are identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system.
	2.7	Faults in the control components of the system are rectified to raise a.c. motor control system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report fault diagnosis and rectification activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in a.c. motor drive systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI145A Variable speed drives for a.c. motors

Evidence shall show an understanding of a.c. variable speed drive to an extent indicated by the following aspects:

T1. Methods and operating principles

T2. Installation requirements

T3. Filtering

T4 Performance characteristics

T5 Set up and commissioning

T6 Common faults: their symptoms and causes.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment

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is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace

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procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in a.c. motor drive systems as described in 8) and including:

A	Applying logical diagnostic methods.
B	Using fault scenarios to test the cause of system faults.
C	Identifying faults and competency needed to rectify them.
D	Rectifying faults in system controls.
E	Verifying that the system operates correctly.
F	Documenting fault rectification.
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in a.c. motor drive systems

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to diagnosing and rectifying at least four faults and control a.c. motor drive system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and control

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UEENEEI146A Diagnose and rectify faults in d.c. motor drive systems

Modification History

		UEENEEI146A	Diagnose and rectify faults in d.c. motor drive systems	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit. .	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers diagnosing and rectifying faults in systems controlling starting, speed, torque, power output, efficient running and braking of d.c. motors. The unit encompasses safe working practices, interpreting technical data, applying knowledge of d.c motors operating parameters to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved

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contract of training at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the

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Prerequisite Unit(s) **4)**

	workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI148A	Solve problems in single phase electronic power control circuits
UEENEEI149A	Solve problems in polyphase electronic power control circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose a.c. motor control system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Causes of the faults are identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system.
	2.7	Faults in the control components of the system are rectified to raise a.c. motor control system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.

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ELEMENT		PERFORMANCE CRITERIA	
		2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Complete and report fault diagnosis and rectification activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is made safe in accordance with established safety procedures.
		3.3	Rectification of faults is documented in accordance with established procedures.
		3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required knowledge and skills and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in d.c. motor drive systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI146A Variable speed drives for d.c. motors

Evidence shall show an understanding of d.c. variable speed drive to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1	• Methods and operating principles
T2	• Installation requirements
T3	• Filtering
T4	• Performance characteristics
T5	• Set up and commissioning
T6	• Common faults their symptoms and causes.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing

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requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnosing and rectifying faults in d.c. motor drive systems as described in 8) and including:

A	Applying logical diagnostic methods.
B	Using fault scenarios to test the cause of system faults.
C	Identifying faults and competency needed to rectify them.
D	Rectifying faults in system controls.
E	Verifying that the system operates correctly.
F	Documenting fault rectification.
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and

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materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in d.c. motor drive systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to diagnosing and rectifying at least four faults in a d.c. motor control system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Instrumentation and control

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UEENEEI147A Diagnose and rectify faults in servo drive systems

Modification History

		UEENEEI147A	Diagnose and rectify faults in servo drive systems	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit. .	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers diagnosing and rectifying faults in systems controlling servo and drives. The unit encompasses safe working practices, interpreting technical data, applying knowledge of servo/stepper drives operating parameters to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology

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Prerequisite Unit(s) **4)**

	equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI148A	Solve problems in single phase electronic power control circuits
UEENEEI149A	Solve problems in polyphase electronic power control circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to

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ELEMENT	PERFORMANCE CRITERIA	
		diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose servo/stepper drive control system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Causes of the faults are identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system.
	2.7	Faults in the control components of the system are rectified to raise servo drive control system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of

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ELEMENT		PERFORMANCE CRITERIA	
			materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Complete and report fault diagnosis and rectification activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is made safe in accordance with established safety procedures.
		3.3	Rectification of faults is documented in accordance with established procedures.
		3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in servo drive systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI147A **Servomechanism systems**

Evidence shall show an understanding of servomechanism systems to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Servomechanism terminology and concepts encompassing:

- null, error signal, feedback and reference signal
- damping: under, over, critical
- hunting
- overshooting
- deadband
- response time
- time lag

T2 Difference between an open loop and a closed loop system encompassing:

- the operation of a servomechanism system to block diagram level identifying the components:
- command transmitter
- error detector
- amplifier
- summing point/network
- servo
- position feedback
- rate feedback
- acceleration feedback
- modulator/demodulator

T3 Differences in operation between types of servomechanism systems encompassing:

- a.c., d.c. and hybrid types
- advantages and limitations

T4 Causes of hunting.

T5 Inspection, testing, and alignment of a servomechanism system

T6 Common faults their symptoms and causes.

T7 Programming and configuration of a PLC driven servo system

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in servo drive systems as described in 8) and including:

A Applying logical diagnostic methods.

B Using fault scenarios to test the source of system faults.

C Identifying faults and competency needed to rectify them.

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D	Rectifying faults in system controls.
E	Verifying that the system operates correctly.
F	Documenting fault rectification.
G	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in servo drive systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to diagnosing and rectifying at least four faults in a servo/stepper drive control system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and control

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UEENEEI148A Solve problems in single phase electronic power control circuits

Modification History

		UEENEEI148A	Solve problems in single phase electronic power control circuits	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit. .	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers solving problems with electronic aspects of single phase power control devices and circuits. The unit encompasses safe working practices, interpreting diagrams, applying knowledge of electronic power control devices and their application, using effective problem solving techniques, safety and functional testing and reporting work activities and outcomes.

Note.

Typical single phase electronic power control problems are those encountered in meeting performance requirements and compliance standards, revising control operating parameters and dealing with control malfunctions.

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Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace for work involving direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrotechnology

Electronics and Communications

Electrical

Instrumentation and control

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits

Electrotechnology Pathway Group

Unit Code	Unit Title
UEENEEH102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH139A	Troubleshoot basic amplifier circuits
UEENEEH169A	Solve problems in basic electronic circuits

Electronics and Communications Pathway Group

Unit Code	Unit Title
UEENEEH102A	Repair basic electronic apparatus faults by replacement of components
UEENEEH114A	Solve problems in frequency dependent

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Prerequisite Unit(s) **4)**

	circuits
UEENEEH139A	Troubleshoot basic amplifier circuits

Electrical Pathway Group

Unit Code	Unit Title
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Instrumentation and Control Pathway Group

Unit Code	Unit Title
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals
UEENEEI102A	Solve problems in pressure measurement components and systems

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Prerequisite Unit(s) **4)**

UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems
UEENEEI106A	Set up and adjust PID control loops
UEENEEI110A	Set up and adjust advanced PID process control loops
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEI113A	Setup and configure Human-Machine Interface (HMI) and industrial networks

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills **5)**

will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to solve problems in single phase electronic power control systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of single phase electronic power control problem is determined from performance specifications and situation reports and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Solve problems in single phase electronic power control systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of single phase electronic power control device and circuit operation, characteristics and applications are applied to developing solutions to control problems.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Parameters, specifications and performance requirements in relation to each single phase electronic power control problem are obtained in accordance with established procedures.
	2.4	Approaches to resolving single phase electronic power control problems are evaluated to provide most effective solutions.
	2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.6	Problems are solved efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Test and document solutions to single phase electronic power control.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Solutions to single phase electronic power control problems are tested to determine their effectiveness and modified where necessary.
	3.3	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed. (See Note)
	3.4	Justification for solutions used to solve single phase electronic power control problems are documented in accordance with established procedures.

Note:

A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solve problems in single phase electronic power control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI148A **Single phase electronic power control circuit**

Evidence shall show an understanding of single phase electronic power control circuit to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1. Introduction to Power Control:

- Advantages and benefits of power control
- Need for power control and typical applications
- Power control methods
- Types of solid state switches
- Block diagram of a power converter
- Power control terminology
- Modes of operation.

T2. Single Phase Power Rectifiers:

- Single Phase Rectifier Circuit Configurations
- Resistive/Inductive Loads
- Output Voltages/Waveforms
- Ripple Voltage/Frequency
- Peak Reverse Voltages
- Free Wheeling Diodes

T3. Silicon Controlled Rectifiers (SCRs):

- Construction and Symbol
- Basic Operating Principles
- Characteristics
- Gate Requirements
- Commutation
- Electrical Ratings
- Testing SCRs
- Applications.

T4. Triacs and Gate Turn Off (GTO) Thyristors:

- Triac Construction and Symbol
- Triac Basic Operating Principles
- Triac Characteristics
- Triac Triggering Modes
- Triac Electrical Ratings
- Triac Testing
- GTO Construction and Symbol
- GTO Basic Operating Principles
- GTO Characteristics
- GTO Electrical Ratings
- Applications for Triac and GTOs

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REQUIRED SKILLS AND KNOWLEDGE

T5. Power Transistors (BJTs):

- BJT Construction and Symbol
- BJT Basic Operating Principles
- BJT Characteristics
- BJT Electrical Ratings
- BJT Testing
- Applications for BJTs

T6. Power Field Effect Transistors (FET):

- Types of FETs used for power control
- Power FETs Construction and Symbol
- FET Basic Operating Principles and Characteristics
- IGBT Basic Operating Principles and Characteristics
- Power FET Electrical Ratings
- Power FET Testing
- Applications for Power FETs

T7. Triggering Devices Diac:

- construction and symbol
- operating principles
- breakover voltage.
- Unijunction transistors (UJTs)
- construction and symbol
- operating principles
- intrinsic standoff ratio and peak point voltage

T8. Programmable Unijunction Transistors (PUTs):

- construction and symbol
- operating principles
- programmable standoff ratio
- peak point voltage

T9. Triggering Circuits:

- R-C Time Constant Circuits
- Diac Trigger Circuit Operation
- UJT Relaxation Oscillator Circuit Operation
- PUT Relaxation Oscillator Circuit

T10. Half Wave Controlled Rectification:

- Phase shift control

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REQUIRED SKILLS AND KNOWLEDGE

- Controlled rectifiers
- Controlled rectifier power output control
- Single Phase Half-Wave Controlled Rectifier
- Circuit configuration
- circuit operation
- waveforms
- load voltage
- applications and limitations
- Problems Associated with Phase Shift Control

T11. Full Wave Controlled Bridge Rectification:

- Single phase full-wave controlled bridge rectifier circuit
- Output voltage
- Output waveforms
- Applications and limitations
- Advantages and disadvantages

T12. Fully Controlled Bridge Rectification:

- Single phase fully controlled rectifier bridge circuit
- Output voltage
- Output waveforms
- Applications and limitations
- Advantages and disadvantages

T13. Single-Phase a.c. Voltage Control:

- Phase control of a.c. power
- Circuit configurations - half and full control circuits
- Triggering circuits
- Circuit performance and operation on resistive and inductive loads
- Output voltage and waveform, determination of output voltage using circuit characteristics
- Range of control with inductive loads
- Triggering problems associated with inductive loads.
- Applications and limitations

T14. Zero Voltage Switching (ZVS):

- Operating principles
- Circuit configuration – including trigger circuits
- Circuit operation and waveforms – resistive loads only

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REQUIRED SKILLS AND KNOWLEDGE

- Relationship between load power and conduction time
- Solid state relays; types and ratings
- Applications and limitations

T15. Fault Finding of Power Control Circuits:

- Fault finding procedures
- Typical faults – power and trigger circuits
- Characteristics displayed by common faults
- Comparison of test data with expected data (voltage/current waveforms)
- Location and replacement of faulty components

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

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access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing

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requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in single phase electronic power control systems as described in 8) and including:

A Understanding the extent of the single phase electronic power control problem.

B Obtaining electronic device and circuit parameters, specifications and performance requirements appropriate to each problem.

C Testing and solutions to single phase electronic power control problems.

D Documenting justification of solutions implemented in accordance with established procedures.

E Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this

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unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing solutions to single phase electronic power control problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified required skills and knowledge are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEH113A	Troubleshoot amplifiers in an electronic apparatus

OR

UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational

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health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solve problems in at least four single phase electronic power control systems

Note.

Typical single phase electronic power control problems are those encountered in meeting performance requirements and compliance standards, revising control operating parameters and dealing with control malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI149A Solve problems in polyphase electronic power control circuits

Modification History

		UEENEEI149A	Solve problems in polyphase electronic power control	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit. .	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers solving problems with electronic aspects of polyphase power control devices and circuits. The unit encompasses safe working practices, interpreting diagrams, applying knowledge of electronic power control devices and their application, using effective problem solving techniques, safety and functional testing and reporting work activities and outcomes.

Note.

Typical polyphase electronic power control problems are those encountered in meeting performance requirements and compliance standards, revising control operating parameters and dealing with control malfunctions.

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Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace for work involving direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEI124A	Fault find and repair analogue circuits and components in electronic control systems
UEENEEI148A	Solve problems in single phase electronic power control circuits

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to solve problems in polyphase electronic power control circuits	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the

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ELEMENT		PERFORMANCE CRITERIA	
			work.
		1.3	The extent of polyphase electronic power control problem is determined from performance specifications and situation reports and in consultations with relevant persons.
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
		1.5	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Solve problems in polyphase electronic power control circuits	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of polyphase electronic power control device and circuit operation, characteristics and applications are applied to developing solutions to control problems.
		2.3	Parameters, specifications and performance requirements in relation to each polyphase electronic power control problem are obtained in accordance with established procedures.
		2.4	Approaches to resolving polyphase electronic power control problems are evaluated to provide most effective solutions.
		2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.6	Problems are solved efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Test and document solutions to polyphase electronic power control.	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Solutions to polyphase electronic power control problems are tested to determine their effectiveness and modified where necessary.
	3.3	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed. (See Note)
	3.4	Justification for solutions used to solve polyphase electronic power control problems are documented in accordance with established procedures.

Note:

A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solve problems in polyphase electronic power control circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI149A Polyphase electronic power control circuit

Evidence shall show an understanding of polyphase electronic power control circuit to an extent indicated by the following aspects:

T1 Three Phase Rectifier Circuits encompassing:

- Three-Phase Circuit Configurations
- Resistive/Inductive Loads
- Output Voltages/Waveforms
- Ripple Voltage/Frequency
- Peak Reverse Voltages
- Free Wheeling Diodes
- Measurement of rectifier output parameters.

T2 Three-Phase Half Wave Controlled Rectifiers encompassing:

- Phase control
- Purpose/operation of half controlled rectifiers
- Circuit configuration
- Rectifier performance and operation - resistive loads
- Output voltage – resistive load
- Rectifier performance and operation - inductive loads
- Rectifier output waveforms
- Applications and limitations
- Advantages and disadvantages three-phase controlled rectifiers.

T3. Three-Phase Half Controlled Bridge Rectifier encompassing:

- Purpose/operation of a half controlled bridge rectifiers
- Circuit configuration and connections
- Rectifier output - resistive loads
- Output voltage – resistive loads
- Rectifier output - inductive loads
- Output voltage - inductive loads
- Flywheel diode
- Output voltage calculations
- Applications and limitations

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REQUIRED SKILLS AND KNOWLEDGE

- Advantages and disadvantages three-phase half controlled bridge rectifiers.

T4. Three-Phase Fully Controlled Bridge Rectifier encompassing:

- Purpose/operation of a fully controlled bridge rectifiers
- Circuit configuration and connections
- Rectifier output - resistive loads
- Output voltage – resistive loads
- Rectifier output - inductive loads
- Output voltage - inductive loads
- Flywheel diode
- Output voltage calculations
- Applications and limitations
- Advantages and disadvantages three-phase fully controlled bridge rectifiers.

T5. Three-Phase a.c. Controllers encompassing:

- Circuit configurations
- Circuit operation
- Triacs and SCRs circuits
- Triggering requirements
- Output voltage and waveforms
- Determination of output voltage
- Applications
- Advantages and disadvantages

T6. DC Converters encompassing:

- Purpose and operation of d.c. converters
- Circuit configurations
- Voltage control methods
- Forced commutation methods
- Calculation of load voltage
- Output voltage/waveforms
- Applications
- Advantages and disadvantages

T7. Cycloconverters encompassing:

- Purpose/operation of a cycloconverter
- Basic circuit configurations
- Measurement of output voltage
- Calculation of load voltage
- Output voltage/waveforms
- Applications and limitations
- Advantages and disadvantages

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REQUIRED SKILLS AND KNOWLEDGE

T8. Invertors encompassing:

- Purpose/operation of a inverter
- Basic circuit configurations
- Measurement of inverter outputs
- Output voltage
- Applications and limitations
- Advantages and disadvantages

T9. Thyristor Protection encompassing:

- Power Control Devices Failure
- Protection Techniques
- Snubber Networks
- Series Inductors
- Amp Trap (HRC) fuses
- Gate Pulse Suppression

10. Installation of Thyristor Devices and Circuits encompassing:

- Need for heat sinking of power thyristor devices
- Heat sink features and types
- Installation methods for all types of thyristor packages
- Basic thermal model, only to demonstrate the effect of different heat sink
- Types and profiles and installation methods on thyristor junction temperature.

T11. Series and Parallel Thyristor Connections encompassing:

- Purpose of Series/Parallel Connection
- Series Connections
  - Reasons
  - Operational Problems
- Parallel Connections
  - Reasons
  - Operational Problems

T12. Fault Finding Three Phase Thyristor Circuits encompassing:

- Fault finding procedures
- Typical faults – power and trigger circuits
- Characteristics displayed by common faults
- Comparison of test data with expected data (voltage/current waveforms)
- Location and replacement of faulty components

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in polyphase electronic power control circuits as described as described in 8) and including:

A Understanding the extent of the polyphase electronic power control problem.

B Obtaining electronic device and circuit parameters, specifications and performance requirements appropriate to each problem.

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C	Testing and solutions to polyphase electronic power control problems.
D	Documenting justification of solutions implemented in accordance with established procedures.
E	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing solutions to polyphase electronic power control problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3

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'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified required skills and knowledge are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI148A	Solve problems in single phase electronic power control problems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to solve problems in at least four polyphase electronic power control circuits.

Note.

Typical polyphase electronic power control problems are those encountered in meeting performance requirements and compliance standards, revising control operating parameters and dealing with control malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electronics

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UEENEEI150A Develop, enter and verify discrete control programs for programmable controllers

Modification History

		UEENEEI150A	Develop, enter and verify discrete control programs for programmable controllers	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers development, installation and testing of programs for programmable controllers (PLC) for a system requiring discrete control functions. It encompasses working safely, applying knowledge of control systems, control system development methods, using ladder diagrams/statement list/function block diagram instruction sets, following written instructions and documenting program development and testing activities.

Application of the Unit

Application of the Unit

2)

This unit is intended to augment formally-acquired competencies. It is suitable for employment-based

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programs under an approved contract of training.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop enter and verify program.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards that have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	Control system scenario is determined from job specifications of the process/plant/machine to be controlled, and through consultation with appropriate person(s).
	1.5	Equipment, software and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
	1.6	Installation of programmable controller is checked for compliance with regulations and job specification.
2 Develop control system and enter and test program.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3	Control solutions are developed and documented based on the specified control mode and using acceptable methods for designing control systems.
	2.4	Developed control system is converted to an appropriate form, such as flow, state and ladder diagrams(See Note 1)
	2.5	Program is entered into the programmable control using a personal computer and appropriate software.
	2.6	Entered instructions and settings are tested as meeting those specified in by the control system scenario.
	2.7	Appropriate methods and tools are used to

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ELEMENT	PERFORMANCE CRITERIA
	test control systems and operating faults and anomalies are identified and rectified. (See Note 2)
	2.8 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Verify, document and report programming activities.	3.1 OHS work completion risk control measures and procedures are followed.
	3.2 Program is transferred from a programmable controller to an external medium for storage. (See Note 3)
	3.3 Control system specification and program are documented in accordance with established procedures.
	3.4 Work completion is reported and appropriate personnel notified in accordance with established procedures.

Note.

1. Example of control functions are derived timers (off delay, self resetting, constant duty cycle), reversible counters, cascading timers, cascading counters, combining timers and counters, internal relays/flags/markers, latching relays (set/reset), jump instructions, master control instructions, bit shift registers, scan time considerations, one shot, retentive (power fail) functions, simple step sequence instructions

2. Examples of control system testing methods and tools are monitor mode as an aid to fault finding, inbuilt hardware/software diagnostics and use of error codes.

3. Examples of storage mediums are IC storage, hard disks, servers.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing, entering and verifying discrete control programs for programmable logic controllers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI150A Programmable controller

Evidence shall show an understanding of programmable controller to an extent indicated by the following aspects:

T1. PLC Introduction encompassing:

- Evolution of the programmable controller and applications
- Relay control, static logic control and programmable control
- Programmable controller block diagram (Inputs and Outputs)
- Programmable controller advantages
- Programmable controller symbols
- Programmable controller functions
- Numbering systems start-up procedures
- Programming inputs and outputs
- Operation of programmable controller inputs
- PLC operation: scan cycle
- Basic programming

T2. Types of PC programs encompassing:

- Ladder diagrams
- Basic Programming
- Program modification
- Ladder diagram development
- Connecting the programmable controller.

T3. Programming Timers encompassing:

- Purpose of timers
- Timer instructions
- On-delay timer instruction
- Off-delay timer instruction
- Programming timers
- Retentive and non-retentive timers
- Cascading timers
- The self-resetting timer

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REQUIRED SKILLS AND KNOWLEDGE

- Monitoring timers
- Circuit conversion

T4. Programming Counters encompassing:

- Counter instructions
- Retentive and non-retentive counter
- Programming counters
- Up/down counters
- Self resetting counter
- Cascading counters
- Circuit conversion

T5. Program Storage encompassing:

- PLC terms
- Memory
- Using the PROM pack
- Printing ladder diagrams

T6. PLC Input and Output Modules encompassing:

- Purpose of modules

T7 PLC input modules:

- dry contact input modules;
- AC input modules, DC input modules;
- Analog input modules

T8 Output modules:

- relay output;
- Triac output;
- transistor output;
- analog output modules

T9. PLC Installation Requirements encompassing:

- Installation precaution
- Safety systems
- AS/NZS requirements
- Mounting the PLC
- Installation documentation
- Routing signal and power cables
- Locating PLCs and I/O
- Earthing Requirements

T10. Master Control encompassing:

- Master control relay

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REQUIRED SKILLS AND KNOWLEDGE

- Master control relay ladder diagram
- Programming master control relays

T11. Jump Function encompassing:

- Jump function
- Jump function ladder diagram
- Programming jump functions

T12. The Shift Register encompassing:

- Purpose of Registers
- The shift register
- Shift register operation
- Clock input
- Shift register requirements
- Programming shift registers

T13. The Step Sequencer encompassing:

- Step Sequencers
- Step sequencer operation
- Clock input
- Step Sequencer requirements
- Programming step sequencer

T12. PLC Diagnostics and Fault Finding encompassing:

- PLC Fault Finding
- Controller Status
- I/O Faults
- Program Faults

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop, enter and verify programs for programmable controllers as described in 8) and including:

A Developing a control system solution to the required operating functions and parameters.

B Identifying non-compliance conditions of device installation.

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C	Converting control system to a PLC program.
D	Entering programming functions and parameters correctly.
E	Transferring programs to a PLC.
F	Correcting programming anomalies.
G	Testing and verify control system operation.
H	Transferring program to external storage.
I	Documenting control system and programming clearly.
J	Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

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The resources used for assessment should reflect current industry practices in relation to developing, entering and verifying programs for programmable logic controllers using ladder instrument set.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing, entering and verifying programs for programmable logic controllers. The program shall include at least five of the following functions/controls:

- Derived timers (off delay)
- Self resetting
- Constant duty cycle
- Reversible counters
- Cascading timers
- Cascading counters
- Combining timers and counters
- Internal relays/flags/markers
- Latching relays (set/reset)
- Jump instructions
- Master control instructions
- Bit shift registers
- Scan time considerations
- One shot
- Retentive (power fail) functions
- Simple step sequence instructions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.

Modification History

		UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers development, installation and testing of programs for an industrial system requiring advance control functions. It encompasses working safely, using structure logic, acceptable design techniques, applying knowledge of high level instructions, and documenting development and programming activities.

Application of the Unit

Application of the Unit

2)

This unit is intended to augment formally-acquired competencies. It is suitable for employment-based

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programs under an approved contract of training.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEI150A	Develop, enter and verify discrete control programs for programmable

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Prerequisite Unit(s) **4)**

logic controllers

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop industrial control systems programs.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Mode of operation of the control system is determined from job specifications of the process/plant/machine to be controlled, and through consultation with appropriate person(s).
	1.4	Equipment, software and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
	1.5	Installation of programmable controller is checked for compliance with regulations and job specification.
2 Develop and enter and programs for industrial control systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Control solutions are developed and documented based on the operational mode and using acceptable methods for designing control system that contain numeric variables and values.
	2.3	Developed control solution is entered using a personal computer and software applicable to the programmable controller.
	2.4	Programming elements are written and used to manipulate word data. (See Note 1)
	2.5	Program control values are assigned using applicable numbering systems and codes. (See Note 2)
	2.6	Programs are written to read and write analogue signals, both with and without.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Arithmetic functions are used to scale analogue inputs to a specified engineering span.
	2.8	Arithmetic functions are used to un-scale an engineering value to drive an analogue output.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Monitor, verify and document programming activities.	3.1	Device operation is tested in strict accordance OHS requirements and procedures.
	3.2	Entered instructions and settings are tested as meeting those specified for the control mode requirements.
	3.3	Appropriate methods and tools are used to test and monitor control programs and operating faults, anomalies are identified and rectified. (See Note 3)
	3.4	OHS work completion risk control measures and procedures are followed.
	3.5	Control system specification and program are documented in accordance with established procedures.

Notes.

1. Example of programming elements are loading data from discrete input switches to an internal register; manipulating internal registers using arithmetic, logical and other functions; driving outputs from internal registers; utilizing thumbwheel switches and displays; manipulating double registers with mathematical operations; loading constants, variables and presets in and out of memory; using masking of registers to obtain desired data; using tables for the storage of data.

2. Examples are binary, integer, signed integer and REAL numbering systems and codes such as BCD or ASCII

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ELEMENT	PERFORMANCE CRITERIA
	3. Examples of control program testing and monitoring methods and tools are locating status bits (flags); examining and modifying watchdog timer; investigating the implications of rung positioning in relation to scan and interrogating error codes.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8)This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing, entering and verifying programs for industrial control systems using high level instructions.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI151APLC analogue and word programming

Evidence shall show an understanding of PLC analogue and word programming to an extent indicated by the following aspects:

T1. Numbering systems and codes encompassing:

- Types of numbering systems
- Codes
- Application of Codes
- Conversion between codes and numbering systems

T2. Use PLC software encompassing:

- Install programming software
- Memory mapping
- Computer software
- Manufacturers' Instruction Manuals

T3. PLC Hardware encompassing:

- Selection
- Installation
- Configuration
- Signals
- Resolution

T4. Analogue Modules encompassing:

- Comparison of signals
- Resolution of analogue signals
- Connection of analogue field
- Programming
- Loop fault

T5 Data manipulation encompassing:

- IEC data types
- Word Structure
- Select Bits Transfer

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REQUIRED SKILLS AND KNOWLEDGE

- Move
- Block Transfer
- Compare
- Block Compare
- And Words
- Mask
- Maths Function
- Scaling and Un-scaling
- Special registers
- Shift Register
- Multiplexing

T6 Sequencer encompassing:

- Application
- Event and Time Driven
- Programming Application

T7 Languages encompassing:

- Ladder
- CSF
- STL

T8 Diagnostic encompassing:

- Special Register
- Software Diagnostics
- Edits
- Rung Scan Faults

T9 Complex Industrial Process encompassing:

- Describe Process
- Write Program
- Edit Program
- Connect and Run Program
- Documentation

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Developing, entering and verifying programs for industrial control systems using instructions as described in 8) and including:

A Developing a control system to the required operating functions and parameters.

B Identifying non-compliance conditions of device installation.

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C	Entering programming functions and parameters correctly.
D	Correcting programming anomalies.
E	Testing and verify device operation.
F	Documenting control system and programming clearly.
G	Dealing with unplanned events by drawing on required knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing, entering and verifying programs for industrial control systems using high level instructions.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing, entering and verifying word and analogue control programs for programmable logic controllers applied to representative range of at least five of the following:

- Hardware/Software configuration
- Number systems and converting between systems
- Basic diagnostics
- Binary word structure
- INT, DINT and REAL arithmetic operations
- Scaling and unscaling engineering units

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI152A Develop, enter and verify programs in Supervisory Control and Data Acquisition systems

Modification History

		UEENEEI152A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	Adjust numbering in Elements and Performance Criteria.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers development, installation and testing of programs for supervisory control and data acquisition. It encompasses working safely, process analysis, developing process condition database and Human-Machine Interface (HMI) using SCADA software package and documenting programming activities.

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Application of the Unit

Application of the Unit **2)**

This unit is intended to augment formally recognised competencies. It is suitable for employment-based programs under an approved contract of training.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title

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Prerequisite Unit(s) **4)**

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEI150A	Develop, enter and verify discrete control programs for programmable logic controllers
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop programs for supervisory control and data acquisition systems.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the SCADA system is determined from design brief and process specifications.
	1.4	Process data are analysed for development of graphical design/mimic diagrams.
	1.5	PLC analogue and digital addresses are related to tag database.
	1.6	Tag data types are configured in the database.
	1.7	Graphic objects are created and where appropriate are added to a graphic library. (See Note 1)
	1.8	Consideration is give to the security requirements for the SCADA system to prevent access by unauthorised personnel.
	1.9	The SCADA system is configured to provide appropriate reporting mechanisms.
	1.10	Equipment, software and testing devices needed to carry out the work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop and enter programs using dedicated supervisory control and data acquisition software.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	SCADA software is used to develop human-machine interface (HMI) of processes.
	2.3	Supervisory control functions, data acquisition components and automated tasks are programmed using SCADA software.
	2.4	Data is manipulated within the SCADA software.
	2.5	Alarms and limits for process variables are identified and programmed accordingly.
	2.6	Trends for process variables and limits are programmed accordingly.
	2.7	Reports are configured to display/print appropriate information.
	2.8	User rights/security is configured to provide appropriate access to the different sections/controls of the SCADA system.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Monitor, verify and document programming activities.	3.1	Device operation is tested in strict accordance OHS requirements and procedures.
	3.2	Entered objects and settings are tested as meeting those specified in the design brief.
	3.3	SCADA software tools are used to test and monitor programs and operating faults, anomalies are identified and rectified.
	3.4	OHS work completion risk control measures and procedures are followed.
	3.5	SCADA system specification and program are documented in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA
	3.6 Work completion is reported and appropriate personnel notified in accordance with established procedures.

Note.

1. Graphic libraries are typically part of vender software for SCADA systems.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing, entering and verifying programs in Supervisory Control and Data Acquisition systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies..

KS01-EI152A Supervisory control and data acquisition systems programming

Evidence shall show an understanding of supervisory control and data acquisition systems programming to an extent indicated by the following aspects:

T1. SCADA system communications and networking encompassing:

- PLC Interface requirements
- Networking requirements of the system
- SCADA system differences from DCS Process Control systems
- SCADA HMI software package costing
- Types of networks available with SCADA HMI
- Coordinate and access of networking to factory network
- Understands the difference between SCADA and Process Control systems

T2. Mimics and animated graphics encompassing:

- Graphic designs, balance clarity of layout and navigation
- Assessment of data required to be entered in software package
- Validation of entered data

T3. Trending encompassing:

- Analysis of process to select data, i.e., sampling of the process
- Viewing data and graphical representation of selected information
- Trend graphs and data matching
- Understands the difference between real time trends and historic trends.

T4. Alarm logging encompassing:

- Analysing selected data and applying limits to processes
- Corrective actions and notifications of alarm status
- Alarm data availability for third party software systems

T5. Recipes and scheduling encompassing:

- Methods of producing libraries for different process parameters required for varied production runs
- Analysis of different production runs, i.e., amounts of materials, pressure,

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REQUIRED SKILLS AND KNOWLEDGE

temperature, weights etc.

- Alarm limits/material specifications
- Understands where & when scheduling is used
- Scheduling, setting limits and evoking program changes

T6. Data collection and databases encompassing:

- Produce a database of variable tags and range specifications involved in the process
- Conversion Export of raw data into appropriate forms for data management and report creation, e.g., Excel, Paradox
- Types and layout of reports
- Aims of customer, management, statistical and account reports
- Analysis of data in reports: Design and graphical data representations
- Assessment of data required for the report

T7. Programming language encompassing:

- Scripting languages in SCADA HMI software
- Automate tasks within the software PLC or SCADA?
- Provide complex processing of process data where field equipment i.e. PLC!! does not have the capability or to minimise control lag

T8. Implementation and applications encompassing:

- Typical applications in manufacturing and process control, e.g., food processing, packaging, automotive industry, energy management and steel production and mining

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment,

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such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Developing, entering and verifying programs in Supervisory Control and Data Acquisition systems as described in 8) and including:

A Collecting and analysing data accurately.

B Converting data to an appropriate database.

C Creating appropriate graphic objects.

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D Adding graphic objects to a library.

E Developing effective HMI.

F Programming SCADA functions and data acquisition components correctly.

G Producing a report by the SCADA system

H Correcting programming faults and anomalies.

I Configuring user access rights.

J Documenting SCADA system and programming clearly.

K Dealing with unplanned events by drawing on required knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to develop, enter and verify programs in Supervisory Control and Data Acquisition systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing entering and verifying programs in Supervisory Control and Data Acquisition systems.

The program shall include the following programming activities:

- Configuring tag data type
- Creating at least five graphic objects
- Adding graphic objects to the graphic library
- Developing a HMI for a given system
- Incorporating alarms and limits for process variables
- Incorporating trends for process variables and limits.
- Entering objects and testing
- Rectifying operating faults and anomalies
- Configure user rights for access/security.
- Configure and output at least one report.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI153A Design and configure Human-Machine Interface (HMI) networks

Modification History

		UEENEEI153A	Design and configure Human-Machine Interface (HMI) networks	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers monitoring and maintaining the operation of distributive and central control system networks. It encompasses safe working practices, installing and configuring controllers and devices, monitoring system operations, diagnosing malfunctions and faults and documenting development activities.

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 6 or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEI150A	Develop, enter and verify discrete control programs for programmable logic controllers
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design control system networks.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of control system networks is determined from network specifications/design brief and in consultation with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Appropriate management tools and software are selected based on specified requirements and performance standard.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Strategies are implemented to ensure network development is carried out efficiently.
2 Install, configure and manage control system networks.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge and complexities of control system networks infrastructure are applied to managing network services.
	2.3	Network infrastructure components are installed and configured in compliance with industry standards and variants as specified for the network.
	2.4	Structural components of directory services are installed and configured in compliance with industry standards and variants as specified for the network.
	2.5	Management components of network control system are configured in compliance with industry standards and requirements specified for the network.
	2.6	Security components of network control system are created in compliance with industry standards and requirements specified for the network.
	2.7	Network malfunctions are identified and rectified using logical techniques and drawing knowledge of complex network control system infrastructure.
	2.8	Network is monitored and solutions are developed to optimise network performance and reliability in accordance with established procedures.
	2.9	Security events are analysed and actions taken in accordance with established policy.
	2.10	Approaches to issues/problems are analysed to provide most effective solutions.
	2.11	Quality of work is monitored against personal

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ELEMENT	PERFORMANCE CRITERIA	
		performance agreement and/or established organisational or professional standards.
3 Report network administration activities.	3.1	Written justification is produced for network services development activities and appropriate person/s notified in accordance with established procedures.
	3.2	Network service development records are maintained in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing and configuring Human-Machine Interface networks.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI153A Control system network

Evidence shall show an understanding of control systems networks to an extent indicated by the following aspects:

T1. Purpose and application of control system networks systems

T2. Open and common proprietary control system networks models (layers) and protocols - CANopen, ControlNet, Devicenet, Ethernet, Foundation Fieldbus, Interbus, Modbus, Pofibus.

T3. Control system networks interface.

T4. Domain Name Service (DNS) encompassing:

- DNS Server Service
- Root name server
- Configuring zones - configuring for dynamic updates and delegating zone for DNS
- Caching – only server
- DNS client
- Testing DNS Server service
- Manually creating DNS source
- Managing and monitoring DNS

T5. Dynamic Host Configuration Protocol (DHCP)

- Installation of DHCP Server Service
- DHCP scopes, superscopes and multicast scopes
- DHCP – DNS integration
- Active DirectoryTM
- Managing and monitoring DHCP

T6. Network Infrastructure encompassing:

- Configuring and troubleshooting remote access - remote access policy, configuration of remote access profile, Virtual Private Network (VPN), multi link connection, routing and remote access for DHCP
- Managing and monitoring remote access
- Remote access security - authentication protocols, encryption protocols and access policy

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REQUIRED SKILLS AND KNOWLEDGE

T7. Network Protocols encompassing:

- Installation, configuration and troubleshooting of network protocols - Transmission Control Protocol / Internet Protocol (TCP/IP), NWLink and network bindings
- Configure TCP/IP packets
- Configuring and troubleshooting network protocol security and IP Security (IPSec
- Managing and monitoring network traffic

T8. Internet Naming Services in a network encompassing:

- Installation, configuring and troubleshooting
- Configuring Internet Naming Services replication
- Configuring an application networking interface
- Managing and monitoring Internet Naming Services

T9. IP Routing encompassing:

- Installation, configuring and troubleshooting of IP routing protocols - updating routing tables, and implementing demand-dial routing
- Managing and monitoring IP routing - border routing, internal routing and IP routing protocols

T10. Network Address Translation (NAT) encompassing:

- Installing Internet connection sharing
- Installing NAT
- Configure NAT properties and interfaces

T11. Certificate Services encompassing:

- Installing and configuring Certificate Authority
- Issuing and revoking certificates
- Removing the Encrypted File System recovery keys

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design and configure Human-Machine Interface networks as described in 8) and including:

A Establishing network services to be developed.

B Installing and configuring network infrastructure components.

C Installing and configuring structural components of directory services.

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D	Configuring management components of network services.
E	Creating security components of network services.
F	Identifying and rectifying network malfunctions.
G	Developing solutions to optimise network performance.
H	Documenting network services development activities.
I	Dealing with unplanned events by drawing on required knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing and configuring Human-Machine Interface networks.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to safe working practices and designing and configuring a representative range of Human-Machine Interface networks with the following attributes:

- operation of distributive and central control system networks monitoring and maintenance
- safe working practices
- controllers and devices installation and configuration
- system operations monitoring
- malfunctions and faults diagnostics
- development activities documentation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI154A Design and use advanced programming tools PC networks and HMI Interfacing

Modification History

		UEENEEI154A	Develop, enter and verify programs in Supervisory Control and Data Acquisition systems	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the design of computer application for control processes. It encompasses apply knowledge of control devices, control systems, programmable logic controllers, supervisory control and data acquisition systems and control programming methods, developing alternative design schemes based on design brief, customer relations and documenting designs.

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Application of the Unit

Application of the Unit **2)**

This unit is intended to augment formally-acquired competencies. It is suitable for employment-based programs under an approved contract of training. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEI150A	Develop, enter and verify discrete control programs for programmable logic controllers
UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to design engineering computer applications.	1.1 OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	The extent of the proposed control system is determined from the design brief or in consultation with appropriate person(s).
	1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2 Develop engineering computer applications design.	2.1	Knowledge of control devices, control systems and control programming methods are applied to the design.
	2.2	Alternative concepts for the design are tested based on the requirements outlined in the design brief. (Note)
	2.3	Safety, functional and budget considerations are incorporated in the design.
	2.4	System design draft is checked for compliance with the design brief and regulatory requirements.
	2.5	System design is documented for submission to appropriate person(s) for approval.
	2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3 Obtain approval for engineering computer applications design.	3.1	System design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

Note.

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ELEMENT	PERFORMANCE CRITERIA
	Design concepts should be tested by real or virtual prototyping where it cannot be shown easily by other means that particular aspects of the design meet specified requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing a computer based control system.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI154A PLC system applications

Evidence shall show an understanding of PLC system applications to an extent indicated by the following aspects:

T1. Alternative/enhancing programming methods

T2. System diagnostics techniques.

T3. Control loops encompassing:

- Regulated loop control
- Proportional / integral /derivative (PID) control
- Applications of PID control
- Methods used to achieve PID control using a PLC

T4. Specialist instructions - interrupt driven applications, high speed counters, positional encoders

T5. Communications methods and requirements encompassing:

- Common protocols and interface standards
- Requirements when networking/interfacing PLC's
- Communication mediums
- Network types and topologies
- Hierarchal networks
- Peer to peer networks
- Handshaking
- Open architecture communications
- Remote I/O

T6. Intelligent terminals/graphic interfaces installation and communication requirements

T7. Data link layer encompassing:

- Device types
- Bus arbitration
- Device initialisation
- Synchronous / Asynchronous messaging.
- Time management

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REQUIRED SKILLS AND KNOWLEDGE

- Link active scheduler specific functions

T8. Bus monitor encompassing:

- capturing
- filtering

T9. Fieldbus message specification encompassing:

- Virtual field device
- Object dictionary
- Communicate objectives
- Communicate services

T10. High speed Ethernet encompassing:

- Protocols
- FDA agents
- Messaging
- Sessions
- Time synchronisation
- Redundancy

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1)**
	Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency

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in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the required knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design a PLC computer based control system as described in 8) and including:

A	Develop and test PLC code using advanced programming tools
B	Program and test a continuous control loop (such as PID) using a PLC.
C	Configure and test a PLC network enabling data to be shared between PLC's.
D	Configure and test a field bus style network (remote I/O)
E	Configure a HMI using software applicable to the PLC available.
F	Dealing with unplanned events by drawing on required knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.

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- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to design a computer based control system.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE01 1C Manage risk in electrotechnology activities

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to designing a computer based control system incorporating at least five interacting subsystems modes.

- Configure and test a PLC Peer to Peer network
- Configure and test a PLC Hierarchical network
- Configure and test a PLC field bus style network
- Develop PLC code using a structured text programming tool
- Develop PLC code using a sequential function chart programming tool
- Design a simple HMI interface using a typical touch screen device
- Use system diagnostics to fault find hardware/software issues
- Program and test a PID functional control/program block

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI155A Develop structured programs to control external devices

Modification History

		UEENEEI155A	Develop structured programs to control external devices	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This competency standard unit covers programming of microprocessor/microcontroller devices to access external devices. The unit encompasses working safely, applying knowledge of control applications, and analogue and digital input/output signals, programming fundamentals, writing and testing program and documenting programming activities.

Application of the Unit

Application of the Unit

2)

This competency standard unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop structured programs for control sub systems.	1.1	OHS processes and procedures for a given work area are obtained and understood.
		1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The extent of structure programming to be developed is determined from job performance specifications and in consultations with relevant persons.
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
		1.5	Appropriate development kit and software are selected based on specified requirements and performance standard.
		1.6	Strategies are implemented to ensure programming is carried out efficiently.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop structured programs for control sub systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of computer functions and features are applied to developing structure program.
	2.3	Correct structure and syntax is applied to developing structure program.
	2.4	Key features of the programming language are applied to develop and test solutions. (Note)
	2.5	Approaches to issues/problems are analysed to provide most effective solutions.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3 Test and document structured program for control subsystems.	3.1	Testing procedures are developed to test developed program.
	3.2	Problems and bugs in program are rectified to ensure specification the creation of the code is met.
	3.3	Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person or persons.

Note:

Although programming in ‘C’ is preferred any other structured language in current use by industry may be used.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing structured programs to control external devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI155A Control programming fundamentals

Evidence shall show an understanding of control programming fundamentals to an extent indicated by the following aspects:

T1. Control applications of software

T2. Software terminology

T3. Programming languages currently used by industry

T4. Program development - flowcharts, pseudocode, algorithms

T5. Programming concepts encompassing:

- programming structure
- documentation
- compiling source code
- generating executable files
- scalar and structured data types
- constants and variables
- reading from keyboard and writing to screen
- arithmetic, relational and logical operations
- making decisions
- looping operations
- programming to access external devices via I/O boards
- functions - macros;
- global and local variables, auto and static variables;
- Intrinsic functions used in control;
- Writing functions;
- Linking in external functions to control hardware
- numerical and character arrays

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the required knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - developing structured programs to control external devices as described in 8) and including:

A Using key features of an appropriate programming language.

B Developing testing procedures.

C Identifying problem and bugs in program.

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D	Rectifying problem and bugs in program.
E	Writing and presenting relevant documentation to an acceptable standard.
F	Dealing with unplanned events by drawing on required knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing structured programs to control external devices.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to developing structured programs to control external devices for a given representative range of programs and control devices with the following attributes:

- safe working practices
- control applications knowledge application
- analogue and digital input/output signals
- programming
- program writing and testing
- programming activities documentation

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI156A Develop and test code for microcontroller devices

Modification History

		UEENEEI156A	Develop and test code for microcontroller devices	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This competency standard unit covers structured programming instructions for micro devices at a fundamental level. The unit encompasses working safely, applying knowledge device architecture and programming fundamentals, writing and testing specified instructions and documenting development activities.

Note.

In this unit the term ‘micro’ refers to microcontrollers however competency in the unit can be achieved using microprocessors.

Application of the Unit

Application of the Unit

2)

This competency standard unit is intended to apply to any recognised development program that leads to the

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acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop and test basic specifications.	1.1	OHS processes and procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of specifications to be developed is determined from job performance requirements and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
	1.5	Appropriate development kit and software are selected based on specified requirements and performance standard.
	1.6	Strategies are implemented to ensure programming is carried out efficiently.

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop basic specification.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of micro controller functions and features are applied to developing specifications.
	2.3	Correct structure and syntax is applied to developing program specification for target micro controller function.
	2.4	Key features of the assembler programming language are applied to develop and test solutions.
	2.5	Approaches to issues/problems are analysed to provide most effective solutions.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test and document the basic specification.	3.1	Testing procedures are developed to analyse code developed.
	3.2	Problems and bugs are rectified to ensure specification the creation of the code is met.
	3.3	Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person or persons.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing and testing code for microcontroller devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI156A Microcontroller programming

Evidence shall show an understanding of microcontroller control system programming methods to an extent indicated by the following aspects:

T1 Microcontroller architecture encompassing:

- Program storage types
- Data storage types
- I/O Ports: analogue/ digital
- Integrated Peripherals: timers, interrupts etc
- Control circuitry: system clock, reset etc

T2. Programmer's model encompassing:

- Industry standard programming environment

T3. Programming terms encompassing:

- Language levels and their features
- Language simulators and emulators

T4. Language programming basics encompassing:

- Programming input/output functions
- Input/output port programming
- Structured assembly programming
- Timing loops

T5. Memory organisation, operation and addressing methods encompassing:

- register structure
- instruction register/decoder
- arithmetic logic unit (ALU)
- accumulator and flags
- instruction cycle timing
- control lines
- stack pointer
- index register

T6. System clock circuits fetch and execute encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- timing cycle
- timing relationship to system clock
- logic levels of system buses for each clock period of an instruction cycle

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing

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on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEE11". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the required knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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- Develop and test code for microcontroller devices as described in 8) and including:

A Using all key features of an appropriate assembler language.

B Developing testing procedures.

C Identifying problem and bugs in program.

D Rectifying problem and bugs in program.

E Writing and presenting work reports to an acceptable standard.

F Dealing with unplanned events by drawing on required knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing and testing code for microcontroller devices.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified required knowledge and skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to developing and testing code for microcontroller devices including at least three of the following:

- Selecting an appropriate micro for a given task
- Setting up and using basic input/output functions
- Using assembler/simulator software packages to debug program
- Finding system faults.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEI157A Configure and maintain industrial control system networks

Modification History

		UEENEEI157A	Configure and maintain industrial control system networks	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers installing, configuring and maintaining communication service on a control network. It encompasses safe working practices, applying knowledge of industrial control network topology and protocols, configuring data links, bus monitoring and system management and access, network testing and documenting system settings.

Note:

This unit applies to all aspects of Electrotechnology – engineering applications only. For general competencies related to Information Technologies refer to the latest endorsed IT Training Package.

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Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

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Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to configure and maintain industrial control system networks.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The nature of the industrial control system and network is established from control system specifications and in consultation with appropriate person(s).
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Network operating system versions and updates

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ELEMENT		PERFORMANCE CRITERIA	
			needed to configure and maintain the network are obtained in accordance with established procedures and checked against job requirements.
2	Configure and maintain industrial control system networks.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Control application network components are installed, upgraded and configured in accordance with developer's instructions and network requirements.
		2.3	Devices, desktop environment, network protocols and services and system security are implemented in accordance with requirements.
		2.4	Access to control data and resources is configured within the limitations specified for each user.
		2.5	Network malfunctions are identified and rectified using logical techniques and drawing knowledge of control devices, storage, network protocols, connections and services and system security configuration processes.
		2.6	Network performance and reliability is monitored and optimised in accordance with established procedures.
		2.7	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.8	Network administration is carried out efficiently without waste of materials and energy or damage to apparatus, the surrounding environment or other services.
3	Document control system network configuration and maintenance activities.	3.1	Written justification is produced for network maintenance and upgrading and appropriate person(s) notified in accordance with established procedures.
		3.2	Network maintenance documentation is maintained in accordance with established

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ELEMENT	PERFORMANCE CRITERIA
	procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the required skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and to configure and maintain industrial control system networks.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI157A Industrial control system networks

Evidence shall show an understanding of industrial control systems networks to an extent indicated by the following aspects:

T1. Purpose and application of control system networks systems

T2. Open and common proprietary control system networks models (layers) and protocols - CANopen, ControlNet, Devicenet, Ethernet, Foundation Fieldbus, Interbus, Modbus, Pofibus.

T3. Control system networks interface.

T4. Data link layer encompassing:

- Device types
- Bus arbitration
- Device initialisation
- Synchronous / Asynchronous messaging.
- Time management
- Link active scheduler specific functions

T5. Bus monitor encompassing:

- capturing
- filtering

T6. Fieldbus message specification encompassing:

- Virtual field device
- Object dictionary
- Communicate objectives
- Communicate services

T7. High speed Ethernet encompassing:

- Protocols
- FDA agents
- Messaging
- Sessions
- Time synchronisation
- Redundancy

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment

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instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the required knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Configure and maintain industrial control system networks as described in 8) and including:

A Establishing industrial control system and network requirements and operating system versions and updates.

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B Installing, upgrading and configuring control application network components correctly.

C Configuring access to control data and resources for each user.

D Identifying network malfunctions.

E Rectifying network malfunctions.

F Documenting network configuration and maintenance activities.

G Dealing with unplanned events by drawing on required knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to configuring and maintaining industrial

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control system networks.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI151A	Develop, enter and verify word and analogue control programs for programmable logic controllers.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to configuring and maintaining an industrial control system networks with at least three distributive control loops, two programmable controllers and one HMI system controller.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Instrumentation and Control

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UEENEEJ040B Manage refrigeration and air conditioning projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the management of refrigeration and air conditioning projects involving design, modifications, installation, and/or maintenance of systems and equipment. It encompasses covers management of safety, budget, variation, personnel, resources, and critical path timelines all necessary progress and completion documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Establish the scope of the project.	1.1	OHS processes and procedures for a given work area are identified, identified, obtained and understood
		1.2	Project' deliverables and budget are established from project planning and other relevant documentation and from discussions with appropriate person(s).
		1.3	Measurable outcomes are identifies to evaluate the project on completion from project planning and other relevant documentation.
		1.4	Plant, materials and skills needed to meet project outcome are established from project planning and other relevant documentation.
		1.5	Processes and procedures are developed for managing contract variations from discussions with appropriate person(s) and in accordance with contractual agreement.
2	Manage project.	2.1	OHS policies, procedures and programs are implemented and monitored.
		2.2	Achievement of project outcomes is delegated to appropriately competent persons involved in the project.
		2.3	Risk events are identified and project plan strategies implemented to ensure that outcomes are achieved to the required standard of quality specified in the contract and safety required by organization's policy.
		2.4	Procurement processes and procedures are monitored to ensure on time supply of plant and materials and in accordance with organisation's policy.
		2.5	Project is progress is monitored against schedule, quality requirements and budget.
		2.6	Conflict issues at the work site and between stakeholders, clients and regulators are identified and managed in accordance with organisation's

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ELEMENT		PERFORMANCE CRITERIA	
			policy.
		2.7	Variations are managed in accordance with agreed processes and in accordance with the contract.
		2.8	Project records are maintained and progress reports written and forwarded to all appropriate person(s).
3	Complete project.	3.1	Project outcomes are reviewed against original plan, implemented risk strategies, contract variations, safety record and budget.
		3.2	Project completion acceptance is sought from appropriate person(s) and hand-over documented in accordance with organisation's policy.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and managing refrigeration and air conditioning projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ040B Refrigeration and air conditioning project management

Evidence shall show an understanding of managing refrigeration and air conditioning project methods and techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Defining project parameters

Note:

Examples may include: Project scope; Project stakeholders and clients; Project phases and the relationship between phases; Time requirements and limitations; Resource requirements and limitations; Quality requirements and limitations.

T2 Time management

Note:

Examples may include: time management concepts; standard practices for ensuring a project runs to time and the like.

T3 Financial management

Note.

Examples may include: Financial management concepts; Standard practices for managing project finances; Project budgets; Costs, variations and estimations; Invoicing against project phases/deliverables; Acquittals and the like.

T4 Quality management

Note.

Examples may include: Quality management concepts; Standard practices for managing quality within a project.

T5 Human Resource management

Note.

Examples may include: human resource management concepts; standard practices for

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REQUIRED SKILLS AND KNOWLEDGE

managing personnel within a project

T6 Communication management

Note.

Examples may include: Communication management concepts; Standard practices for managing communication within a project and the like.

T7 Risk management and contingencies

Note.

Examples may include: risk management concepts; standard practices for managing risk within a project; Internal risks; External risks; Risk minimisation; Risk removal; Contingencies and the like.

T8 Procurement management

Note.

Examples may include: procurement management concepts; standard practices for managing procurement and the like.

T9 Physical Resource management

Note.

Examples may include: Types of physical resource, including; Equipment, Technology, Information, Facilities; Physical resource management concepts; Standard practices for managing physical resources

T10 Contracts

Note.

Examples may include: Understanding project contracts; Standard practices for working to contract specifications; Contract format; Contract content; Legal obligations of contract parties; Accompanying documentation including; Contract Schedules and the like.

T11 Performance assessment and continuous improvement

Note.

Examples may include: standard performance assessment practices; standard continuous improvement practices and the like

T12 Engineering ethics principles

T13 Customer/Client relations

- Importance of customer/client relations
- Interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

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REQUIRED SKILLS AND KNOWLEDGE

KS02-EJ040B **Refrigeration and air conditioning industry sector customs and practices**

Evidence shall show an understanding of refrigeration and air conditioning industry sector customs and practices, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Technical aspects of project planning and management encompassing:

- Method of ensuring equipment meets specified performance requirements
- Performance/cost benefit analysis
- Equipment procurement

Typical approaches to planning and management
Successful planning techniques
Best practice management methods and styles

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment,

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the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Manage refrigeration and air conditioning projects as described in 8) and including:

    A Establishing the scope of the project accurately,

    B Ascertaining the input a project

    C Developing effective management processes,

    D Managing resources and variations effectively

    E Resolving conflicts

    F Adopting risk management strategies

    G Maintaining records and submitting progress reports

    H Meeting project outcomes

    I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used

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to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in managing refrigeration and air conditioning projects

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to managing an industry accepted medium sized refrigeration or air conditioning project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ069B Plan refrigeration and air conditioning projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers development and documentation of Refrigeration and air conditioning project proposals, milestones and completions. It encompasses, establishing budgets, critical path analysis, development of workflow strategies, documenting, presenting and negotiating budgets and timelines.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to plan project.	1.1	OHS processes and procedures for a given work area are identified, identified, obtained and understood
		1.2	Established techniques for project planning are reviewed are adopted in accordance with organisation policies.
		1.3	The extent of the project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s).
2	Develop project plan proposal.	2.1	Estimated plant, material, labour and other costs are sought and obtained from appropriate person(s) in accordance with organisation policies and procedures.
		2.2	Project budget is established from estimated plant, material, labour and other costs in accordance with organisation policies and procedures.
		2.3	Knowledge of critical path analysis is applied to developing workflow strategies.
		2.4	Sources and availability of materials and human resources needed for the project are established in accordance with organisation policies and procedures.
		2.5	Risk management strategies are sought and obtained for incorporating in the project plan.
		2.6	Project plan is reviewed against all inputs and adjusted to rectify any anomalies.
		2.7	Project plan proposal is documented in accordance with organisation policies and procedures.
3	Obtain approval for project plan.	3.1	Project plan is presented and discussed with person(s) of higher authority.
		3.2	Alterations to the project plan resulting from the presentation/discussion are negotiated with

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ELEMENT	PERFORMANCE CRITERIA	
		person(s) of higher authority within the constraints of organisation policy.
	3.3	Final project plan is documented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and planning refrigeration and air conditioning projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ069B Refrigeration and air conditioning project planning

Evidence shall show an understanding of developing and documenting refrigeration and air conditioning project proposals, milestones and completion methods and techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Purpose of project planning

T2 Documents needed to plan a project

T3 Factors influencing sequence and restraints of project activities

T4 Critical path and project analysis

- Purpose
- Essential data
- Relational sequence of work activities
- Graphical representation methods
- Methods of representing time/rates
- Monitoring methods

KS02-EJ069B Refrigeration and air conditioning industry sector customs and practices

Evidence shall show an understanding of refrigeration and air conditioning industry sector customs and practices, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Technical aspects of project planning and management encompassing:

- Method of ensuring equipment meets specified performance requirements
- Performance/cost benefit analysis
- Equipment procurement

T2 Typical approaches to planning and management

T3 Successful planning techniques

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REQUIRED SKILLS AND KNOWLEDGE

T4 Best practice management methods and styles

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for

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EVIDENCE GUIDE

the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan refrigeration and air conditioning projects as described in 8) and including:

    A Determining the project requirements accurately,

    B Establishing a project budget

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EVIDENCE GUIDE

C Developing effective work flow strategies,

D Documenting project plan proposal

E Negotiating alterations to the proposed project plan successfully

F Obtaining approval of the final plan

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in planning refrigeration and air conditioning projects.

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EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to managing an industry accepted medium sized refrigeration or air conditioning project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ102A Prepare and connect refrigerant tubing and fittings

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the basic connection of refrigeration and air conditioning piping/tubing and fittings. It encompasses the safe use of hand, fixed and portable power tools for cutting, flaring, bending, swaging, silver brazing copper tube to copper tube, bundy tube and brass and steel fittings, measurement and reading drawings and diagrams.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

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Application of the Unit

4)

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to fabricate tubing and attach fittings for refrigeration and/or air conditioning systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature of work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Fabricate tubing and attach fittings for refrigeration and/or air conditioning systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Work in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Established methods used to cut, flare, swage, bend, silver braze tubing and fittings as they apply to the refrigeration/air conditioning equipment arrangements.
		2.4	Refrigerant tubing and fittings are silver brazed with the use of dry nitrogen to prevent contamination.
		2.5	Fabricate tubing and attach fittings are prepared efficiently without waste of materials or damage/contamination to apparatus and the surrounding environment or services and using sustainable energy practices.
		2.6	Routine quality checks are carried out in accordance with work instructions/or specifications including dimensions and pressure testing.
3	Complete work and report	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Work supervisor is notified of the completion of the work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and preparing refrigerant tubing and fittings.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ102A Refrigerant tubing and fittings techniques

Evidence shall show an understanding of cutting, bending and joining refrigeration piping and tubing tools, equipment and techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Piping

- Refrigeration & water grade copper tube
- Maintaining cleanliness (always capped, do not blow out with mouth etc)
- Soft and hard drawn tube
- Tubing applications (soft, hard, pair coil, water grade etc)
- Tube qualities - diameter, wall thickness (gauge) and pressure ratings (R410A etc)
- Pipe insulation (types - tube, slit tube, sheet etc and joining methods - glue, tape etc)
- Other tube materials (Bundy, steel, aluminum, brass)

T2 Cutting

- Cutting tools (Imps, normal & large pipe cutters, tube cutting rings etc)
- Precautions while cutting (sharp burrs, sharp blades etc)
- Deburring tools (reamers, deburrers etc)

T3 Bending

- Bending tools (springs, levers, presses etc)
- Precautions while bending (work hardening, collapsing etc)
- Bending hard drawn tube - the process of annealing

T4 Joining

- Flare nuts (plain, short barrel, frost proof, reducing)
- Flaring tools (flare block, eccentric with clutch for high pressure tube)
- Precautions while flaring (deburred, length past block face, cleanliness)
- Swaging tools (punch, flare block, expander etc)

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REQUIRED SKILLS AND KNOWLEDGE

- Precautions while swaging (length past block face, tube shortening effect, cleanliness etc)
- Other tube fittings (BSP to flare elbows, tees, unions, plugs, flare washers, Lokrings etc)
- Thread sealants (tapes, pastes etc)
- Access valves (Schrader, piercing, cut-away of service valve/s)
- Precautions using access valves (refrigerant leakage, core removal, limitations on piercing valves etc)

T5 Soldering and brazing equipment

- Gas types (oxy acetylene, air acetylene, propane, Mapp gas)
- Hazards associated with their use (cylinder transport, remove regulator, oil & oxy = bang)
- Personal safety (MSDS - oxy, acetylene, propane, MAPP gas)
- Flash back arrestors
- Setting up equipment (fitting regulator, adjusting pressures, tip selection)
- Igniting and flame types (flint guns, oxidising, neutral, carburising)
- Care and maintenance of equipment (hoses, regulator, tips, cylinders, flash back arrestors)

T6 Silver solder

- Types (yellow, brown, blue and their metal components)
- Personal safety (MSDS - silver brazing alloys)
- Flux and its use (dissimilar metals)
- Personal safety (MSDS - flux)
- Preparing surfaces (removing oxides, oils, applying flux)

T7 Soldering techniques

- Dry nitrogen
- Personal safety (MSDS - nitrogen)
- Applying dry nitrogen to a piping circuit
- Silver soldering copper to copper
- Silver soldering copper to dissimilar metals
- Annealing copper tube

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement

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EVIDENCE GUIDE

and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria

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EVIDENCE GUIDE

shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Prepare refrigerant tubing and fittings as described in 8) and including:

    A Applying tubing and fitting appropriately to equipment layout

    B Using established methods to cut, flare, bend, swage and silver brazing copper tube

    C Attaching fittings correctly

    D Conducting component routine quality checks

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in preparing refrigerant tubing and fittings.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to preparing refrigerant tubing and fittings for at least two basic different refrigeration/air conditioning equipment layouts, which require cutting, flaring, bending, swaging, silver brazing copper tube to copper tube, bundy tube, brass and steel fittings.

Note:

This includes piping/tubing and fittings for high pressure refrigerants.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ103A Establish the basic operating conditions of vapour compression systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the determination of the operating conditions of vapour compression systems. It encompasses working safely, determining refrigerant pressures and temperatures and relevant air and water temperatures using measurement and basic calculation methods.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

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Application of the Unit

4)

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to determine the basic operating conditions of vapour compression systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	Expected operating conditions are obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

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ELEMENT		PERFORMANCE CRITERIA	
			others
		1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures
		1.7	Tools, equipment and testing devices needed to determine the basic operating conditions are obtained and checked for correct operation and safety
2	Determine the basic operating conditions of vapour compression systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
		2.2	Measuring system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
		2.3	System is checked and isolated where necessary, in strict accordance OHS requirements and procedures
		2.4	Established procedures are used to determine actual and specified range of operating conditions from measured and calculated values as they apply to particular vapour compression systems.
		2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person
		2.7	Operating conditions are determined without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices
3	Complete work and report	3.1	OHS work completion risk control measures and procedures are followed
		3.2	Work site and equipment is cleaned and made safe in accordance with established procedures

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Operation conditions are documented, including identification of any parameter that is not within the specified range for the system
	3.4	Work supervisor is notified of the completion of the work in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and determining the basic operating conditions of vapour compression systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ103A Basic operating conditions of vapour compression systems

Evidence shall show an understanding of basic operating conditions of vapour compression systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Refrigeration Industry

- The history of the refrigeration industry (note that A/C is covered in another unit)
- Applications, classifications and equipment used in the refrigeration industry

T2 Introduction to the Vapour Compression System

- Basic Operation
- Major Components

T3 Heat

- Matter (atoms, molecules, energy and its different forms)
- Heat energy (definition, unit of measurement)
- Enthalpy (definition, unit of measurement)
- Heat flow (hot to cold)
- Heat transfer
  - methods (conduction, convection, radiation)
  - requirements
  - effects

T4 Temperature and relative humidity

- Temperature
- Scale types (imperial, metric, absolute) and their units of measurement
- Conversion to/from absolute values
- Temperature difference/change (td, Δt, unit of measurement)
- Relative humidity
- Thermometer types and applications (digital, stem, dial, max/min, non-contact,

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REQUIRED SKILLS AND KNOWLEDGE

data loggers)

- Relative Humidity measurement devices and applications (dry bulb/wet bulb, sling, digital)
- Hazards and related safe working practices (working near rotating machinery - fans, pulleys, belts etc)
- Care and maintenance (bending stems, overheating, removing batteries after use, uncoiling capillary)
- Calibration (boiling water, iced water, send to a specialist etc)
- Appropriate and safe methods of use
- Typical locations on a system
- Fitting temperature and relative humidity instruments

T5 Sensible and Latent Heat

- Definition of specific heat capacity, latent heat and sensible heat (including units of measurement)
- Types of latent heat
- Heat calculations

T6 Pressure

- Define
- Scale types (imperial, metric, absolute) and their units of measurement
- Vacuum scales (Pascals, microns)
- Conversion to/from absolute values
- The basic Gas Laws – Boyles, Charles and Daltons (excl combined or general gas law)
- Pressure gauge types and applications (pressure, compound, vacuum, manometer, magnehelic, barometer)
- Hazards and related safe working practices (dangerous system pressures)
- Care and maintenance (ingress of oil and contaminants (dirt), avoiding needle bounce (esp. HP) etc)
- Calibration (atmospheric pressure, send to a specialist etc)
- Appropriate and safe methods of use
- Typical locations

T7 Refrigerant conditions

- Saturation temperature
- Saturated liquid / saturated vapour
- Superheated vapour
- Sub-cooled liquid
- Pressure temperature relationships
- P/T charts
- Enthalpy

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REQUIRED SKILLS AND KNOWLEDGE

T8 The vapour compression cycle

- Primary system components
- High and low pressure sides
- Basic system operation

T9 Working safely with refrigeration vapour compression systems

- Risk management principles and processes
- Hazards and risk control measures associated with:
  - refrigeration vapour compression systems and components
  - refrigerants
  - measuring and testing equipment

T10 Leak detectors

- Detector types and applications (electronic, halide, bubble, ultra violet)
- Hazards and related safe working practices (working around rotating machinery, open flame, ultra violet light etc)
- Care and maintenance (delicate electronic equipment, changing sensor tip filters, changing gas cartridges etc)
- Calibration (auto calibrating , send to a specialist etc)
- Leak detection procedures

T11 Service gauges

- Service Gauges
  - Types (dial gauges or electronic, manifolds with additional vacuum and charging ports & sight glasses)
  - Typical uses for service gauges (high & low side pressure readings, charging, evacuating)
  - Care and maintenance (oil and contaminants (dirt) in hoses, avoiding needle bounce, changing hose seals)
  - Calibration (hoses open to atmosphere, adjusting screw etc)
  - Hose shut-off valves and adaptors (access control valves, kwik couplers, Hansen lines etc)
- System Access Fittings
  - Types (Schrader, piercing, service valve, post valve, quick couplers etc)
  - Typical applications for each
  - Hazards and related safe working practices (oil or liquid spray, keeping clean, leaks etc)
  - Care and maintenance (gland nuts loosened/tightened, seal caps fitted, regulations on piercing valves)
- Using Service Gauges
  - Service gauge manifold hose fitting

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REQUIRED SKILLS AND KNOWLEDGE

- Purging
- Pressure readings
- Service gauge manifold hose removal
- Pressure to temperature conversion

T12 Refrigeration Compressors

- Function of the compressor
- Compressor styles (open drive, semi-hermetic, hermetic)
- Types, construction and their applications (reciprocating, rotary, centrifugal, screw, scroll)
- Basic types of compressor oil (Mineral, Polyolester (POE), Alkyl Benzene, Polyalkylene Glycols (PAG)) (brief overview - covered in more detail in J8)
- Methods of lubrication (splash, forced)
- Safe handling (MSDS - POE's, PAG's, Mineral, AB's - Residual acid's in used oil)

T13 Condensers and related components

- Function of the condenser
- Types, construction and their applications (static, forced draught, water cooled)
- Function of a cooling tower
- Types, construction and their applications (natural, induced, forced, evaporative)
- Function of water pumps
- Basic Types and their applications
- Function of liquid receivers
- Types, construction and their applications (horizontal, vertical, combined condenser/receivers)

T14 Evaporators and related components

- Function of the evaporator
- Evaporator styles (direct expansion, flooded)
- Types, construction and their applications (static, forced draught, water cooling)
- Refrigerant/air/water flow paths (forced/induced draft, parallel/counter flow)
- Need for water treatment in water systems
- Methods used to provide water treatment (brief overview)
- Regulations governing water treatment (brief overview)
- Secondary refrigerants (brief overview)
- Properties & applications of secondary refrigerants (water, sodium/calcium chloride, ethylene/propylene glycol)
- Hazards associated with their use (MSDS)

T15 Common Refrigerant Metering Devices

- Function of a refrigerant metering device
- Overview of common types and their applications (capillary tube and TX Valve)

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REQUIRED SKILLS AND KNOWLEDGE

T16 Basic Operating Conditions

- Ambient conditions
- Common climate values (highest max temp, lowest min temp, mean daily temp, mean highest/lowest)
- Typical climates for various common localities
- Evaporator Td
- Effect of changes in Evap. Td and typical industry reference values for water cooled, forced draught and static coils
- Condenser Td
- Effect of changes in Cond. Td and typical industry reference values for water cooled, forced draught and static coils
- Typical storage conditions (temp & RH) for common products (dairy, produce, meat and frozen food rooms)
- Typical high and low side system operating values (pressures and temperatures allowing 1K equivalent PD)

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced

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EVIDENCE GUIDE

by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Determine the basic operating conditions of vapour compression systems as described in 8) and including:

    A Selecting and using appropriate measuring devices correctly

    B Recording measurements

    C Using calculation methods accurately

    D Identifying the conditions of a refrigerant at various locations in the vapour compression system

    E Documenting operating conditions correctly

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment	**9.3**) This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include: • OHS policy and work procedures and instructions. • Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit. These should be part of the formal learning/assessment environment. Note: Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy. Evidence should show demonstrated competency in determining the basic operating conditions of vapour compression systems.
Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining operating conditions using measurement and basic calculation methods of vapour compression systems whether used for refrigeration or air conditioning. These conditions include suction and discharge pressures, ambient, evaporator and condensing temperatures, evaporator, and condenser temperature difference.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ104A Establish the basic operating conditions of air conditioning systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the determination of basic operating conditions of air conditioning systems. It encompasses working safely, determining air temperature, air flow rates and relative humidity using measurement and basic calculation methods.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also

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Application of the Unit

4)

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to determine the basic operating conditions of air conditioning systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	Expected operating conditions are obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures
		1.7	Tools, equipment and testing devices needed to determine the basic operating conditions are obtained and checked for correct operation and safety
2	Determine the basic operating conditions of air conditioning systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
		2.2	Measuring system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
		2.3	System is checked and isolated where necessary, in strict accordance OHS requirements and procedures
		2.4	Established procedures are used to determine actual and specified range of operating conditions from measured and calculated values as they apply to particular air conditioning systems
		2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person
		2.7	Operating conditions are determined without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices
3	Complete work and report	3.1	OHS work completion risk control measures and procedures are followed
		3.2	Work site and equipment is cleaned and made safe in accordance with established procedures
		3.3	Operation conditions are documented, including identification of any parameter that is not within the specified range for the system
		3.4	Work supervisor is notified of the completion of the work in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and determining the basic operating conditions of air conditioning systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ104A Basic air conditioning operating conditions

Evidence shall show an understanding of basic air conditioning operating conditions, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 The Air Conditioning Industry

- Industry classifications (Domestic, Commercial, Industrial and Transport)
- Applications (shopping centres, housing, offices) and typical equipment used in each classification (split systems, central plant, chemical production etc)
- Types of systems commonly used such as self-contained units (RAC's), split systems, ducted systems, package units and central plant systems.

T2 Working safely with air conditioning systems

- Risk management principles and processes
- Hazards and risk control measures associated with:
  - air conditioning systems and components
  - measuring and testing equipment

T3 Temperature & relative humidity measuring devices

- Thermometer types and applications (digital, stem, dial, max/min, non-contact, data loggers)
- Relative Humidity measurement devices and applications (dry bulb/wet bulb, sling, digital)
- Hazards and related safe working practices (working near rotating machinery - fans, pulleys, belts etc)
- Care and maintenance (bending stems, overheating, removing batteries after use, uncoiling capillary line)
- Calibration (boiling water, iced water, send to a specialist etc)
- Typical locations where values are commonly obtained (temp, RH %)
- Obtaining temperature and relative humidity readings
- Recording temperature and relative humidity readings (using DB/WB method and/or

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REQUIRED SKILLS AND KNOWLEDGE

electronic)

T4 Air velocity measuring devices (Anemometers only)

- Anemometer types (digital vane, hot wire)
- Typical applications for each
- Air speed (velocity and its units of measurement)
- Air flow rate (volume flow rate and its units of measurement)
- Methods for setting up and using anemometers (hood, patch, sweep)
- Hazards & safe working practices (working near rotating machinery - fans, pulleys, belts / working at height)
- Care and maintenance (maintaining vane balance (bent blades), removing batteries after use etc)
- Calibration requirements (by specialists)
- Typical locations where air velocity measurements values are commonly obtained (grilles and outlets etc)
- Obtaining and recording air velocity readings (using the patch method and/or sweep method)
- Calculating volume flow rate from an outlet/grille

T5 Psychrometrics

- Composition of air
- Psychrometric chart
- Terms used in the study of air (and their units of measurement) (DB, WB, RH%, dew point, enthalpy, moisture content)
- Sensible heat, latent heat and total heat
- Sensible heat ratio
- Plotting basic points on a chart (supply air, return air)
- Reading additional information (dew point, moisture content, RH%, specific heat capacity, enthalpy)
- Values relevant to a plotted process and plotting a simple process on a psychrometric chart

T6 Basic air conditioning processes

- Factors effecting human comfort (temp, RH%, air velocity, noise, cleanliness, fresh air)
- Industry recognised human comfort conditions
- The comfort zone
- Basic processes used to obtain comfort conditions (sensible cooling, dehumidifying, humidifying etc)

T7 Ventilation

- Basic needs for ventilation (removal of stale air, removal of toxic gases e.g. car parks, welding bays etc)
- Methods used to ventilate an area (natural, supply, exhaust)

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REQUIRED SKILLS AND KNOWLEDGE

- Typical applications for ventilation systems (car parks, kitchens, toilets etc)

T8 Regulations

- Covering ventilation (AS1668 parts 1 & 2)
- Common council requirements/regulations (no DA required, noise levels not exceeding 5dBA above background, fresh air in residential situations etc)
- Fresh air requirements for typical situations (calculate using floor area method and air change method)

T9 Heat loads

- Sources of sensible heat in an air conditioned space
- Sources of latent heat in an air conditioned space
- Changes in sensible/latent ratios and their effect on operating system capacity
- Industry check figures
- Basic room heat load calculation using check figures
- Basic RAC/split system unit selection

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

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EVIDENCE GUIDE

various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Determine the basic operating conditions of air conditioning systems as described in 8) and including:

    A Selecting and using appropriate measuring devices correctly

    B Interpreting measurements

    C Using calculation methods accurately

    D Identifying parameters not within the specified range

    E Documenting operating conditions correctly

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in determining the basic operating conditions of air conditioning systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining the basic operating conditions using measurement and basic calculation methods of air side components of air conditioning systems. These conditions include air dry and wet bulb temperatures, relative humidity, air velocity and volume flow rates across a grille/register.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ105A Position, assemble and start up single head split air conditioning and water heating heat pump systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers the assembly, installation and starting up and de-commissioning of single head split air conditioning systems andsplit water heating heat pump systems up to a maximum of 18kWr refrigeration capacity. It encompasses working safely and to standards, following routine procedures to install equipment, connecting pipe work, pressure testing, evacuating, perform functional checks and complete installation / regulatory documentation.

Note: The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 may apply to this unit. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also be used to augment previously acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 may apply to this unit. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

2. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
3. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ172A	Recover, pressure test, evacuate, charge and leak test refrigerants split systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEJ102	Prepare and connect refrigerant tubing and

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Prerequisite Unit(s) **2)**

A fittings

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assemble, install and start up split air conditioning and water heating heat pump systems	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented
	1.4	The work is appropriately sequenced in accordance with job schedule

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	The layout of the pipe work to be installed is determined from job/manufacturer specifications and diagrams
	1.7	Materials needed to carry out the work are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to conduct the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.9	Appropriately licensed electrician is engaged to carry out all electrical work for the air conditioning and water heating heat pump system
	1.10	Appropriately licensed plumber is engaged to carry out all mains water piping work for the heat pump hot water system
	1.11	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2 Assemble, install and start up split air conditioning and water heating heat pump systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	System components are positioned in the specified location and assembled in strict accordance with manufacturer instructions and industry standards
	2.3	Interconnecting refrigerant piping/tubing is prepared and assembled in strict accordance with manufacturer instructions and industry standards.
	2.4	Components are pressure tested and evacuated in strict accordance with manufacturer instructions and industry standards

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons, documented are dealt with safely and with the approval of an authorised person
	2.6	Ongoing checks of the quality of installation and start up are undertaken in accordance with established procedures
	2.7	Notification is given to appropriate person(s) that the system is ready for electrical and mains water connection in accordance with established procedures. (see note 1)
	2.8	The work is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles
3 Decommission split air conditioning and water heating heat pump systems	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Refrigerant is pump down and/or recovered from the indoor unit. Interconnecting refrigerant piping/tubing is removed and the indoor and outdoor refrigerant circuits are sealed in accordance with manufacturer instructions and industry standards/codes of practice
	3.3	Appropriately licensed electrician is engaged to isolate and disconnect electrical supply and cabling from the air conditioning and water heating heat pump system
	3.4	Indoor and outdoor unit, refrigerant pipework, water pipeowork condensate drains and electrical conduits/cables are un-mounted.
	3.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons, documented are dealt with safely and with the approval of an authorised person
	3.6	The work is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles

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ELEMENT	PERFORMANCE CRITERIA	
4 Test single head split air conditioning and water heating heat pump systems and document	4.1	OHS risk control work completion measures and procedures are followed
	4.2	The system performance is tested to ensure compliance with technical standards, manufacturer/ job specifications and requirements (Note 2)
	4.3	Work site and equipment is cleaned and made safe in accordance with established procedures. (Note 3)
	4.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures

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Note.
1. a. Electrical connection shall be carried out by an appropriately licensed electrician.
b. Mains water connection shall be carried out by an appropriately licensed plumber.2. Unit performance is completed after associated electrical work is carried out by an appropriate electrically licensed person.
3. Making safe includes leak testing and fitting of caps to all refrigerant access ports, which could allow refrigerant to escape into the environment. It includes de-commissioning.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and positioning, assembling and starting up split air conditioning and water heating heat pump systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ105A Split air conditioning and water heating heat pump system installation

Evidence shall show an understanding of split air conditioning and water heating heat pump system installation, start-up and decommissioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Sustainable energy

- The earth's atmosphere
- The greenhouse effect
- Energy usage in Australia (gases, coal, fuel oil etc)
- Projected population increase and its effects
- International and national greenhouse imperatives: the role of regulators and similar bodies (Kyoto Protocol)

T2 Sustainable energy work practices

- Definitions
- Renewable energy technologies (solar, wind, biomass, geothermal, tidal, hydro, nuclear)
- The concept of co-generation
- Economic benefits of sustainable energy initiatives

T3 Heritage awareness

- Heritage listings (concept and types (world, national, commonwealth etc))
- Purpose of regulations related to maintenance of listed sites
- Responsibilities while working in and around listed sites

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REQUIRED SKILLS AND KNOWLEDGE

- Environmental protection
- Government agencies (AGO, EPHC, DEC etc)
- Environmental protection (land, water, atmosphere, human settlement, biodiversity etc)
- Purpose of regulations related to environmental protection
- Responsibilities while working in and around environmentally protected sites
- Protocols for working in and around protected sites (legislated acts - ozone protection etc)

T4 Relevant installation codes

- Applicable standards and codes (building, electrical, health, environmental – OH&S act, ozone protection act, Refrigerant Handling Code of Good Practice
- Introduction to MEPS (minimum energy performance standards) and the star rating

T5 Split air conditioning systems

T6 Types and applications

- categories (high wall, floor mounted, ceiling mounted, cassette, ducted)
- sub categories (single head, multi head)
- types (cooling only, reverse cycle, inverter, dc)
- typical applications for each category / type
- system ratings (hp vs kw, standard ambient conditions for capacity ratings ,actual star rating examples)
- Components, construction and operation
- evaporators (finned induced and forced draught)
- metering devices (capillary, restrictor)
- service ports (ball valves, post valves, schrader valves)
- reverse cycle (reversing valves)
- air distribution – non-ducted (fans, filters, swing louvers etc)
- air distribution - ducted (ducting types, bto's, dampers, outlets, grilles, plenums, filters etc)
- typical ducting layouts (maps)
- typical mechanical system layouts (cooling only, reverse cycle)
- evaporating and condensing temperatures / pressures - design and typical operating values
- controls - operating and safety (encapsulated lp & hp sensors, compressor overload, de-ice stat etc)

T7 Split water heating heat pump systems

- Types and typical applications. including hot water heating and swimming pool heating
- Components, construction and operation
- Cooling coil
- Heating coil
- Metering devices (capillary, restrictor)

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REQUIRED SKILLS AND KNOWLEDGE

- Service ports (ball valves, post valves, Schrader valves)
- Typical mechanical system layouts
- Evaporating and condensing temperatures / pressures - design and typical operating values
- Controls - operating and safety (encapsulated LP & HP sensors, compressor overload, etc)

T8 Installation of unit and pipework

- Respect for customers premises (on-time, respectful language, private commodities, toilets, clean-up etc)
- Noise and vibration (problems for neighbours, typical council requirements)
- Location & mounting - outdoor unit (suitable locations, slabs, brackets (wall/roof), machine pads (e.g. waffle) etc)
- Location & mounting - indoor unit/water heater (suitable locations, penetrations, hanging, mounting methods)
- Refrigerant piping (layout, installation, insulation, pair coil, protection (steel trunking, plastic pipe duct))
- Condensate drains and pumps (correct drainage, safety drain on FCU, condensate pumps)
- Personal safety (safe lifting, correct use of ladder and platforms)
- Manufacturers installation instructions (examples of typical manufacturers installation guides)
- Electrical connections by electrician
- Mains water connections by plumber

T9 System start up

- Manufacturers start-up instructions (examples of typical manufacturers guides)
- Pressure testing refrigerant pipework and system (nitrogen)
- Evacuation
- Opening outdoor unit valves
- Checking refrigerant charge (pressures, temperatures, sweat line, evaporator superheat etc)
- Adding refrigerant (manufacturers recommended top-up values for longer pipework runs)
- Leak detection
- Customer familiarisation (completing warranty card, operating instructions, general maintenance instructions)

T10 De-commission split air conditioning systems

- Closing isolations valves on outdoor unit.
- Indoor unit pump down and recovery
- Sealing refrigerant components
- Electrical isolation and disconnection by electrician

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REQUIRED SKILLS AND KNOWLEDGE

- Mains water isolation and disconnection by plumber
- Unit, piping, drain and electrical cable removal

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment

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instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Position, assemble and start up split air conditioning and water heating heat pump systems as described in 8) and including:

    A Determining job requirements correctly

    B Positioning and assembling system components to specifications

    C Assembling piping and tubing to specifications

    D Pressure testing an evacuating the system in accordance

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with manufacturer's instructions and industry standards, codes and regulations.

Note:
Refrigerant purging is not permitted in Australia

E Giving notification to appropriate person for electrical connections to be completed

F De-commissioning single head split air conditioning and water heating heat pump units

G Testing system performance correctly to manufacturer design specifications

H Documenting work activities

I Demonstrating a basic understanding of system performance outside manufacturers design specifications

J Demonstrating a basic understanding of the compressor, condenser, evaporator and flow control types and their function relevant to single head split system installation

K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in positioning, assembling and starting up split air conditioning and water heating heat pump systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to the assembly, installation and starting up and de-commissioning of single head split air conditioning and water heating heat pump systems (hot water or swimming pool) up to a maximum of 18kWr 'refrigeration' capacity with the following attributes:

- safe working
- Australian/New Zealand standards applied
- routine procedures followed
- equipment installation
- pipe work connection
- pressure test
- evacuation
- functional performance checks
- installation/regulatory documentation completion

Note:
1. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill and the Ozone Protection and Synthetic Gas Management Regulations apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

2. This includes the installation, commissioning and de-commissioning of single head wall hung split air conditioning and water heating heat pump systems. The maximum plant capacity for each system is 18 kWr.

3. This unit DOES NOT COVER COMPETENCIES FOR service, repair, maintenance, diagnostic/fault finding and electrical work and the safe and proper installation of commercial refrigeration and air conditioning and water heating heat pump plant and equipment.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

Modification History

Release	Action	Core/Elective	Details	Points
2	Update	N/A	Concurrent Assessment Unit to UEENEEJ107A	N/A

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the installation, in buildings and premises, of refrigerant piping/tubing, fittings, flow controlsand accessories for refrigeration and air conditioning systems. It encompasses working safely and to installation standards, routing pipe work to specified locations, connecting components and accessories and documenting installation work.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It is suitable for augmenting previously acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings

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Prerequisite Unit(s) **2)**

UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install pipe work, flow controls and accessories	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been

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ELEMENT	PERFORMANCE CRITERIA	
		identified are noted and established risk control measures are implemented
	1.4	Pipe work, flow control and accessory installation is appropriately sequenced in accordance with job schedule
	1.5	The nature and location of the work is determined from documentation or appropriate person(s) to establish the scope of work to be undertaken
	1.6	Pipe work routes are planned within the constraints of the building structure, (heritage) significants, specifications and regulations
	1.7	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.8	Materials needed install pipe work, flow controls and accessories are obtained in accordance with established procedures and checked against job requirements
	1.9	Tools, equipment and testing devices needed to install the pipe work, flow controls and accessories are obtained in accordance with established procedures and checked for correct operation and safety
	1.10	Preparatory work is checked to ensure no damage has occurred and complies with requirements
2 Install pipe work, flow controls and accessories	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OH&S requirements and procedures
	2.3	Pipework, flow controls and accessories are installed to comply with technical standards and job specifications and requirements with sufficient access to affect connections and maintenance
	2.4	Pipework, flow controls and accessories are installed straight and square in the required locations and within acceptable tolerances

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Refrigerant tubing and fittings are silver brazed with the use of dry nitrogen to prevent contamination
	2.6	Problematic situations that arise from the installation of the pipe work, flow controls and accessories are dealt with in an appropriate manner.
	2.7	Ongoing checks of the quality of pipe work, flow controls and accessories are undertaken including pressure testing and repair of leaks in accordance with the relevant technical standards and specifications and established procedures
	2.8	Checking operation, adjusting settings and replacement of flow controls
	2.9	Pipe work, flow controls and accessories areinstalled efficiently without waste of materials, damage or contamination to apparatus and the surrounding environment or services and using sustainable energy practices
3 Completion of pipe work, flow controls and accessories installation.	3.1	OHS risk control measures and procedures at the completion of work are followed
	3.2	Work site is cleaned and made safe in accordance with established procedures
	3.3	Final check of the installed pipe work is made to verify that it complies to all requirements
	3.4	'As-installed' pipe work, flow controls and accessories are documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing pipe work for refrigeration and air conditioning systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ106A Refrigerant pipework, flow controls and accessories

Evidence shall show an understanding of refrigerant pipework, flow controls and accessories, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Environmental and building regulation

- types of heritage listings
- purpose and principles of regulations related maintaining heritage sites
- responsibilities of those working in and around heritage sites
- scope of environmental protection and related regulations
- purpose and principles of regulations related to environmental protection
- responsibilities of those working in and around environmentally protected sites
- the protocols for working in and around protected environments and heritage sites.

T2 Refrigeration pipework

- appropriate piping arrangements for refrigerant lines including discharge lines, liquid lines, suction lines
- position of equipment in relation pipework
- requirements for vertical and horizontal pipe runs.
- requirements for oil return and prevention of flood back
- techniques for the prevention of noise and vibration
- insulation requirements and materials
- pipework insulation requirements, including relevant technical standards, regulations and codes
- pipe work installation techniques
- insulation requirements and materials

T3 Refrigerant pipework accessories

- types
  - including pipe work fittings, hand valves, isolation valves, solenoid valves,

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REQUIRED SKILLS AND KNOWLEDGE

check valves, reversing valves, filter/dryers, sight glasses, accumulators, oil separators, pressure relief devices

- applications
- operation
- location and installation
- testing
- replacement

T4 Refrigerant liquid flow controls and distributors

- types
  - including capillary, hand expansion valve, thermostatic expansion valve, thermo-electric expansion valve, electronic expansion valve, low side floats, high side floats, liquid level controllers
- applications
- operation
- location and installation
- testing and adjusting settings
- replacement

T5 Refrigerant vapour flow controls

- types
  - including evaporator pressure regulators, crankcase pressure regulators, condenser bypass valves, electronic valves/controllers
- applications
- operation
- location and installation
- testing and adjusting settings
- replacement

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

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EVIDENCE GUIDE

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

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- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install refrigerant pipe work, flow controls and accessories for refrigeration and air conditioning systems as described in 8) and including:

A Reading and interpreting drawings related to pipe work layouts and apparatus locations

B Routing, placing and securing pipe work to comply with requirements

C Placing and securing flow controls and accessories accurately

D Connecting pipe work, flow controls and accessories to comply with requirements

E Cleaning pipe work of contaminants

F Ensuring pipe work, flow controls and accessories will not leak under pressure

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G Checking operation, adjusting settings and replacement of flow controls

H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in installing pipe work for refrigeration and air conditioning systems.

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EVIDENCE GUIDE

Method of assessment

9.**4**)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.**5**)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ107A	Install refrigeration and air conditioning systems, major components and associated equipment

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to the installation of pipe work,flow controls and accessories for at least two different types of refrigeration and/or air conditioning systems.

The pipe work shall include suction lines, liquid lines, discharge lines andcontrol lines.. Accessories shall include pipe work fittings, hand valves, isolation valves, solenoid valves, check valves, reversing valves, filter/dryers, sight glasses, accumulators, oil separators. Flow controls shall include both liquid and vapour flow controls, mechanical and electronic.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the installation of refrigeration and air conditioning systems including unitary equipment, compressors, condensers, evaporators, liquid receivers, , pipework, ventilation and air handling (excluding central plant) and associated equipment. It encompasses working safely and to installation standards to match equipment with that specified for a given specification and location, connecting pipe work and components, and complete the necessary installation documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training and may be used to augment other electrotechnology qualifications at AQF 3 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **2)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

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Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install refrigeration and air conditioning systems, major components and associated equipment	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented
	1.4	The nature and location of the work is determined from documentation or appropriate person(s) to establish the scope of work to be undertaken.
	1.5	Component and equipment installation is appropriately sequenced in accordance with job

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ELEMENT	PERFORMANCE CRITERIA	
		schedule
	1.6	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.7	Materials needed to install components, equipment and pipe work are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to install the components,equipment and pipework are obtained in accordance with established procedures and checked for correct operation and safety
	1.9	Preparatory work is checked to ensure no damage has occurred and complies with requirements
2 Install refrigeration and air conditioning systems, major components and associated equipment	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Components,equipment and pipework are installed to comply with technical standards, job specifications and requirements with sufficient access to affect electrical connections and maintenance.
	2.4	Components, equipment and pipework are installed straight and square in the required locations and within acceptable tolerances.
	2.5	Refrigerant tubing and fittings are silver brazed with the use of dry nitrogen to prevent contamination.
	2.6	Problematic situations that arise from the installation of components, equipment and pipework are dealt with in an appropriate manner.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Ongoing checks of the quality of pipe work are undertaken, including pressure testing and repair of leaks in accordance with the relevant technical standards and specifications and established procedures.
	2.8	Components, equipment and pipework are installed efficiently without waste of materials or damage/contamination to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete installation.	3.1	OHS risk control measures and procedures at the completion of work are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final check of the installed components, equipment and pipework is made to verify that it complies to all requirements
	3.4	'As-installed' components, equipment and pipework is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing refrigeration and air conditioning systems, major components and associated equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ107A Refrigeration and air conditioning refrigeration systems, major components and associated equipment installation

Evidence shall show an understanding of refrigeration and air conditioning refrigeration systems, major components and associated equipment installation, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Refrigeration equipment installation requirements and procedures

- Standards, codes and requirements applicable to installing refrigeration equipment
- Environmental and building regulations
- Major components and associated equipment including condensing units, compressors, condensers, cooling towers, liquid receivers, evaporators, fan coil units, package units, fans and air distribution equipment, pumps
  - Functions, types, operation and applications
  - Installation techniques encompassing: manufacturers specifications and installation instructions; locating and placing major components
- Accessories installation
- Connecting piping
- Maintenance of fire rating integrity.

T2 Cool room and freezer room systems installation requirements and procedures

- Food spoilage encompassing; Effects of storage conditions, Controlled atmosphere, Relative humidity, Evaporator temperature difference, Room design conditions
- Room types and construction encompassing; Pre-fabricated and permanent type walk-in cool rooms and freezer rooms, Construction, Insulation, Vapour barrier, Frost heave, Interior fittings
- Layouts and installation encompassing; Location of equipment, Equipment site arrangements and building services, Access and obstructions, Power supply and electrical services, Arrangement of piping

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REQUIRED SKILLS AND KNOWLEDGE

- Components and features encompassing; Refrigerant controls, Evaporators, Solenoid valves, Crankcase pressure regulators, Defrosting method and mullions, Drain facilities and heaters, Pressured relief valves, Door hardware, Lighting and germicidal lamps
- System and defrost controls encompassing; Operating conditions, Thermostat and pressure controls, Defrost timers and controllers, Overloads and safety control, Electrical power and control circuits
- Manufacturers specifications and installation instructions
- Relevant Standards, codes and Regulation requirements
- Relevant Public Health requirements

T3 Merchandising and display cabinets installation requirements and procedures

- Types and construction encompassing: Deep freeze meat, dairy, and fruit and vegetables, Multi deck display type, Single deck, well type and island cases, Glass door/reach-in merchandiser
- Components and features encompassing: Condensing units, Refrigerant controls, Evaporators and fans, Defrosting method and mullions, Drain facilities and drain heaters, Air distribution and air-flow, curtains, Cabinet air temperature, velocity and direction, Accessories, Lighting
- Layouts and installation encompassing: Location of equipment, Equipment site arrangements and building services, Access and obstructions, Power supply and electrical services, Arrangement of piping
- System and defrost controls encompassing: Operating conditions, Alarm systems, Thermostats and pressure controls, Defrost timers and controllers, Electrical power and control circuits
- Multiple systems encompassing: Multiple compressors, Multiple evaporators, Heat reclaim systems, Multi-temperature accessories, Controls and sequencing,
- Manufacturers specifications and installation instructions
- Relevant Standards, codes and Regulation requirements
- Relevant Public Health requirements

T4 Residential air conditioning systems installation requirements and procedures

- Types, components, construction, operation and application of residential air conditioners encompassing: Types: window mounted, high wall, floor and ceiling mounted, cassette and ducted, Typical applications for various types of systems, Components, Construction and Operation of the major components within a system. air distribution, Flexible ducting and associated fittings, fans, filters, noise and vibration, Control systems, Operation of a typical system including reverse cycle
- Procedures for selecting a system for a specific application encompassing; Determining heat load sources using estimating methods and manufacturers data, unit and associated equipment selection
- Installation of unit and pipework encompassing: Respect for customers premises, Unit location and mounting, Flexible ducting and associated fittings, Fixing, securing and mounting methods, Safe lifting, use of ladders and platforms,

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REQUIRED SKILLS AND KNOWLEDGE

Manufacturers installation, Refrigerant piping: layout, installation, insulation, fastening and covering, Condensate drains and pumps

- Starting up system encompassing: Manufacturers start up instructions - pressure testing, evacuation, opening outdoor unit valves, checking refrigerant charge: pressures, temperature, sweat line and evaporator superheat, adding refrigerant, leak detection, controls - operating and safety, customer familiarisation
- Relevant Standards, codes and Regulation requirements

T5 Package air conditioning systems installation requirements and procedures

- Air conditioning design conditions encompassing temperature, humidity and ventilation
- Package air conditioning systems types, construction, components, ancillary equipment, applications and operating conditions
- Layouts and installation encompassing; Location of equipment, Equipment site arrangements and building services, Access and obstructions, Power supply and electrical services, Arrangement of piping
- System controls encompassing; Thermostat and pressure controls, timers and controllers, overloads and safety control, electrical power and control circuits
- Manufacturers specifications and installation instructions
- Relevant Standards, codes and Regulation requirements
- Relevant Public Health requirements

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum,

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EVIDENCE GUIDE

the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install refrigeration and air conditioning systems, major components and associated equipment as described in 8) and including:

    A Reading and interpreting drawings related to pipe work layouts and apparatus locations.

    B Placing, aligning and securing components and equipment to comply with requirements

    C Connecting components, equipment and pipe work to comply with requirements.

    D Cleaning system of contaminants.

    E Ensuring system will not leak under pressure.

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in installing refrigeration and air conditioning systems, major components and associated equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to installing refrigeration and air conditioning systems systems including unitary equipment, major components, pipework, ventilation and air handling (excluding central plant) and associated equipment. for at least 2 different types of refrigeration and/or air conditioning systems.

Major components shall include refrigeration compressors, condensers, condensing units, evaporators, liquid receivers , cooling towers, fans and pumps.

Associated equipment shall include refrigerant flow controls, cycling controls, safety controls and isolation, monitoring and inspection accessories.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers recovery, pressure testing, evacuating, charging and leak testing recovery of refrigerants and lubricants from refrigeration systems and air conditioning systems. It encompasses working safely and to standards, following regulations and industry practices for handling refrigerants and lubricants, and completing the necessary documentation.

Note:
Refrigeration systems may be those used for refrigerating or for air conditioning.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training and may be used to augment other electrotechnology qualifications at AQF 3 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some States/Territories, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to recover refrigerants, pressure test, evacuate, charge and leak test refrigeration systems.	1.1	OHS procedures including codes of practice for a given work area are obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented
	1.4	The nature and location of the work is determined from documentation or appropriate person(s) to establish the scope of work to be undertaken
	1.5	The work is appropriately sequenced in

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ELEMENT	PERFORMANCE CRITERIA	
		accordance with job schedule
	1.6	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.7	Refrigerants, lubricants and cleaning materials needed for the work are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.9	Preparatory work is checked to ensure no damage has occurred and complies with requirements
2 Recover refrigerants, pressure test, evacuate, charge and leak test refrigeration systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Checks are carried out to ensure the system or component parts are isolated, when necessary, in strict accordance with OHS requirements and procedures
	2.3	Circuits/machines/plant are checked as being electrically isolated where necessary in strict accordance OHS requirements and procedures
	2.4	The systems refrigerant and lubricant are tested for contamination
	2.5	Refrigerants are removed from a system safely into suitably labelled containers in accordance with regulatory requirements and industry practices, using appropriate recovery/reclaim equipment
	2.6	Precautions are taken to prevent damage to components while pressure testing the system
	2.7	Pressure testing is conducted at a pressure compatible with the refrigerant to be used

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ELEMENT		PERFORMANCE CRITERIA	
		2.8	Leaks are located and rectified using testing methods appropriate to the system under test and in accordance with industry practices
		2.9	Systems are evacuated to the required level and cleaned of all moisture and other containments in accordance with industry practices
		2.10	A 'Drop test' is used to prove effectiveness of the evacuation in accordance with industry practice
		2.11	The system, vacuum pump and recovery/reclaim unit lubricants are checked and maintained in accordance with manufacturer requirements
		2.12	Systems are charged or retrofitted with the appropriate refrigerant in accordance with manufacturer requirements and industry practices. This includes recording refrigerant usage in an auditable recording system, e.g. logbook.
		2.13	Problematic situations that arise during the work are dealt with in an appropriate manner
		2.14	Systems are pressure and leak tested, evacuated and charged efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices
3	Complete and report refrigerants recovery, pressure test, evacuate, charge and leak test work	3.1	OHS work completion risk control measures and procedures are followed
		3.2	Work site and equipment is cleaned and made safe in accordance with established procedures
		3.3	Contaminated refrigerant and lubricant is dealt with in accordance with legislative/regulatory requirements
		3.4	Completion of the work is documented and recorded, including refrigerant usage in an auditable logbook and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and recovering, pressure and leak testing, evacuating and charging refrigerants.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ108A Refrigerants and lubricants

Evidence shall show an understanding of refrigerants and lubricants, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Introduction to refrigerants

- Purpose of refrigerant
- Primary, secondary and expendable refrigerants
- Ideal properties
- Pure, azeotropic, zeotropic and blend refrigerants
- General safety requirements and personal protection equipment

T2 Relevant Acts, Regulations, Codes and Standards

- The ozone layer (function, ozone depleting substances)
- The ozone protection act and regulation
- State and federal agencies (Dept of the environment, water, heritage and the arts; Dept of climate change; Australian Refrigeration Council Ltd etc)
- State and federal licensing requirements
- Refrigerant handling code of practice 2007
- Relevant Standards
  - Standards philosophy and format
  - How to read and apply a standard
- Equipment manufactures specifications

T3 Refrigerant properties

- Commonly used types, including CFC, HCFC, HFC, high pressure and natural refrigerants
- Terms (blend, azeotrope, zeotrope, glide, CFC, HCFC, HFC, HC, bubble point, dew point, critical point, ODP, GWP etc)
- Typical properties and applications of the current refrigerants used in systems (boiling point, glide, composition (components), comparative latent heat

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REQUIRED SKILLS AND KNOWLEDGE

performance etc)

T4 Safe handling of refrigerants

- Refrigerant identification and the numbering system (AS 1677 part 1 sect 3)
- System refrigerant identification (labeling requirements, Code of Practice)
- Typical hazards (classification groups - AS 1677 part 1 sect 2 and handling precautions - inhalation, skin contact, cardiac sensitization, decomposition, reaction with moisture etc)
- Personal safety (MSDS - all common refrigerants plus phosgene, recommended PPE)
- Cylinders (cylinder terminology (WC, tare etc), transporting safely)
- Safe Filling (density and water capacity methods)
- Decanting methods (pumping, temperature differential etc)
- Recovery cylinders and their safe filling.
- Disposal of recovered refrigerants (including RRA)

T5 Refrigeration oil

- Types (mineral, POE, AB etc) and their applications
- Basic properties (miscibility, dielectric strength, viscosity and hygroscopic abilities)
- Typical issues regarding compatibility (neoprene and POE, POE and mineral etc
- Safe handling (MSDS - POE's, Mineral, AB's - Residual acid's in used oils
- Applications for the various compressor lubricants used in the trade

T6 Recovery and reclaim procedures

- Refrigerant recovery systems and procedures
  - Vapour
  - Liquid
- Recovery cylinders
- Disposing of recovered refrigerants
- Safety and general issues when recovering refrigerant

T7 Pressure testing

- Define
- Pressure testing procedures and test pressures per Standards,
- Codes, Regulations and manufacturers requirements
- Safety and general issues when pressure testing refrigeration systems

T8 Leak detection

- Leak detector types and applications (electronic, halide, bubble, ultra violet, Sulphur stick, litmus paper etc)
- Hazards and related safe working practices (working around rotating machinery, open flame, ultra violet light etc)
- Care and maintenance (delicate electronic equipment, changing sensor tip filters,

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REQUIRED SKILLS AND KNOWLEDGE

changing gas cartridges etc)

- Calibration (auto calibrating , send to a specialist etc)
- Leak testing methods

T9 Evacuation and dehydration

- Evacuation and dehydration
  - Deep vacuum methods
  - Triple evacuation
- Vacuum Measurement
  - Instruments
  - Drop test
- Vacuum Pumps
  - Types, size and applications
  - Use and connections
  - Care and maintenance
- Safety and general issues when evacuating refrigeration systems

T10 Refrigerant and oil charging

- Refrigerant cylinders, storage and safe handling
- Refrigerant charging methods
  - Vapour
  - Liquid
- Safety and general issues when charging refrigeration systems including personal protection equipment
- Refrigerant oil removal and addition tools, procedures and safety

T11 System contamination

- Contaminants (Non-condensables, moisture, acids, carbon, copper etc)
- Effects of contamination (Acid, motor burnout, oil contamination, copper plating, seizing, RMD blockage, excessive condensing temps etc)
- Practices/procedures that cause contamination
- Methods and components use to remove contamination
  - Filter dryers – liquid, suction, burnout
  - Dry nitrogen
  - Flushing agents
- Evacuation

T12 Basic refrigeration component replacement

- Risks of working with refrigerants and rotating equipment
- Refrigerant isolation/pump down/recovery
- Prevention of system contamination
- Protection of damage to surrounding equipment/ environment

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REQUIRED SKILLS AND KNOWLEDGE

- Replace basic components on a refrigeration system, for example filter dryer, sight glass.
- Pressure testing, evacuation, checking refrigerant charge, refrigerant charging and leak detection

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will

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EVIDENCE GUIDE

contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Recover, pressure and leak test, evacuate and charge refrigerants and lubricants as described in 8) and including:

    A Selecting appropriate materials and equipment

    B Testing refrigerant and lubricant for contamination

    C Removing and storing refrigerant correctly

    D Conducting pressure testing at the appropriate pressure level and without damaging components

    E Locating and rectifying leaks

    F Decontaminating and evacuating the system to the required level

    G Charging the system with the appropriate refrigerant

    H Completing the necessary documentation

    I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic

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EVIDENCE GUIDE

assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in recovering, pressure and leak testing, evacuate and charging refrigerants.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ007B	Install refrigeration&air conditioning systems, major components and associated equipment

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to recovery, testing and charging refrigeration systems used for refrigeration or air conditioning encompassing the following:

- recovering refrigerant and lubricant from an existing system that may contains contaminants
- pressure and leak testing a newly installed or repaired system
- evacuating a system in preparation for charging with refrigerant
- selection a suitable refrigerant and lubricant for a given application
- charging a system with refrigerant and lubricant with minimal loss

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers testing and visual inspection for verifying that a refrigeration and air conditioning system and components are safe, comply with requirements and functions as intended. It encompasses working safely, conducting compliance tests, conducting visual inspections, identifying non-compliance defects and mandatory reporting requirements.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle electrotechnology components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, codesand manuals
UEENEEE137A	Document occupational hazards and risks in an electrotechnology environment
UEENEEJ102A	Prepare and connect refrigeration

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Prerequisite Unit(s)	**2)**	
		tubing and fittings
	UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
	UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
	UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
	UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
	UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
	UEENEEJ110A	Select refrigerant piping , accessories and associated controls
	UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
	UEENEEJ113A	Commission air conditioning and refrigeration systems
	UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems
	UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
	UEENEEJ194A	Solve problems in low voltage refrigeration circuits
	UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
	UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
	UEENEEP024A	Attach cords and plugs to electrical

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Prerequisite Unit(s) **2)**

	equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to verify refrigeration and air conditioning installations	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented

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ELEMENT	PERFORMANCE CRITERIA	
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Location of system components is determined from specifications and diagrams
	1.6	Inspection and tests are appropriately sequenced in accordance with job schedule
	1.7	Materials needed for the tests and verification are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety
Visually inspect the installation	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Pipe work is checked for appropriate type and size
	2.4	Pipe work, accessories and components are validated as being suitably located, securely fixed and suitably protected from damage or corrosion
	2.5	System components and accessories are validated as being appropriately rated per manufacture and design specifications
	2.6	Evidence that equipment complies with safety and functional requirements is cited
	2.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person
	2.9	Inspection is carried out efficiently without waste of materials, damage to, or contamination of apparatus

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ELEMENT		PERFORMANCE CRITERIA	
			and the surrounding environment or services and using sustainable energy practices
2	Conduct tests	3.1	OHS risk control measures and procedures for carrying out the work are followed
		3.2	Testing or measuring on a live and operating system in strict accordance with OHS requirements and within established safety procedures
		3.3	Circuits/machines/plant are checked as being isolated in strict accordance OHS requirements and procedures
		3.4	Electrical tests are conducted to verify that the electrical circuit within the refrigeration installation are safe and function as intended
		3.5	Refrigeration tests are conducted to verify that the refrigeration equipment and pipe work within the refrigeration installation is safe and functions as intended
		3.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented
		3.7	Unexpected situations are dealt with safely and with the approval of an authorised person
		3.8	Testing is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices
4	Report inspection and verification findings	4.1	OHS work completion risk control measures and procedures are followed
		4.2	Work site and equipment is cleaned and made safe in accordance with established procedures
		4.3	Non-compliance defects are identified and reported in accordance with established procedures
		4.4	Recommendations for rectifying defects are made in accordance with established procedures

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ELEMENT	PERFORMANCE CRITERIA
	4.5 Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and verifying compliance and functionality of refrigeration and air conditioning installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ109A Refrigeration and air conditioning installation functionality testing and verification methods

Evidence shall show an understanding of refrigeration and air conditioning installation functionality testing and verification methods, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Refrigeration and air conditioning installations, testing and verification methods

- Mandatory testing and verification requirements.
- Optional testing and their appropriate use
- Testing techniques
- Visual inspection methods

T2 Electrical safe working practices

- Hazards associated with low-voltage, extra-low voltage and high-currents
  - Arrangement of power distribution and circuits in an electrical installations
  - Risks and control measures associated an electrical system and equipment that operate at low-voltage and extra-low voltage, and where high-currents are likely.
  - Risks and control measures associated fault finding, maintenance and repair.
  - Isolation and tagging-off procedures.
  - Risks, restrictions and control measures in testing live.
- Risks and control measures associated with harmful dusts and airborne contaminants.

  Note: Sources include thermal insulation, fibrous cement materials and asbestos and other fibre reinforced switchboard materials.
- Safety, selection, use, maintenance and care of test equipment:
  - Safety characteristics of electrical testing devices,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

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REQUIRED SKILLS AND KNOWLEDGE

T3 Refrigeration and air conditioning safe working practices

- Hazards and risk control measures associated with refrigeration/air conditioning components and systems
- Harmful effects of refrigerants
- Control measures for the use, handling and storage of refrigerants
- Risks associated with modifying refrigeration/air conditioning installations, fault finding, maintenance and repair.
- Control measures before, while and after working on refrigeration/air conditioning components and systems.
- Safety, selection, use, maintenance and care of test equipment encompassing:
  - Safety characteristics of refrigeration/air conditioning testing/measuring devices,
  - Safe use of testing/measuring device, and
  - Checks and storage methods for maintaining the safety of testing/measuring devices.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

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EVIDENCE GUIDE

various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Verify compliance and functionality of refrigeration and air conditioning installations as described in 8) and including:

    A Identifying visual defects

    B Conducting all electrical tests safely and correctly

    C Conducting all refrigeration tests safely and correctly

    D Identifying non-compliant defects from test results

    E Recommending appropriate corrective actions

    F Acting within regulatory limits

    G Reporting legibly and accurately

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in verifying compliance and functionality of refrigeration and air conditioning installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to at least two different new or existing refrigeration and air conditioning installations.

Verification shall include:

- Visual inspection of the system, its components pipe work controls and accessories
- Conducting all electrical tests

Note:
1. Electrical testing include isolation testing; insulation resistance of equipment; resistance of the internal circuits of equipment; polarity of supply and equipment; continuity of earthing; correct electrical connections load current.
2. Electrical testing may be limited by the scope permitted under restricted electrical work

- Conducting all refrigeration tests

Note:
Refrigeration testing includes pressure test apparatus/circuits: leak test apparatus/circuits; evacuation test apparatus/circuits; compressor efficiency; controls tests; refrigerant charge; operating pressures; system operation system capacity

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ110A Select refrigerant piping, accessories and associated controls

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the selection of refrigerant piping, accessories and controls for refrigeration and air conditioning installations to comply with regulations, standards and specifications. It encompasses developing refrigerant pipe work arrangements, selecting pipe work and fittings, refrigerant flow controls and accessories, and mechanical and electrical control devices based on specifications, standards and manufacturer catalogues to determine calculated and deemed to comply solutions and documenting all selection information.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It is suitable for augmenting previously acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to select piping, accessories and associated controls	1.1	The extent and nature of the refrigeration installation is determined from job specifications.
	1.2	Safety and other regulatory requirements to which the refrigeration system shall comply, are identified, obtained and understood
2 Develop pipe work arrangements	2.1	The intended location of refrigeration equipment is determined from job specifications and site drawings or deemed to comply arrangements.
	2.2	Pipe work arranged to ensure safe and functional operation of the system.
	2.3	Pipe work is arranged to comply with technical standards and job specifications and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Select piping, accessories and associated controls	3.1	Pipe and tubing is selected for suitability for the environments in which it is to be installed
	3.2	Pipe and tubing is sized to meet refrigeration parameters and capacity requirements for the refrigerant to be used.
	3.3	Pipe and tubing quantities are determined from equipment location diagrams and job specifications.
	3.4	Refrigeration controls and accessories are selected to meet load requirements based on calculated or deemed-to-comply solutions.
	3.5	Control devices are selected to meet functional, specified and regulatory requirements.
	3.6	Electrical control devices are selected to meet current, voltage and IP ratings.
	3.7	Evidence is obtained that the selected refrigeration equipment and control devices comply with all requirements.
4 Document piping, accessories and associated controls selections	4.1	Reasons for selections made, including calculations, are documented in accordance with established procedures.
	4.2	Refrigeration installation arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and selecting refrigerant pipe/tube, accessories and associated controls.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ110A Refrigerant pipe/tube, accessories and associated controls selection

Evidence shall show an understanding of refrigerant pipe/tube, accessories and controls selection for refrigeration and air conditioning installations, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Drawings, Specifications, Regulations & Codes.

- Equipment layouts & drawings
- Site drawings
- Piping diagrams
- Wiring diagrams
- Control diagrams
- Job specifications
- Equipment manufacture's specifications & symbols
- SAA/NZ standards
- SAA/NZ standard symbols
- Regulations & Codes

T2. Equipment Installation Requirements

- Installation Equipment requirements:
- Standards, Codes, and Regulations
- Installation techniques
- Specifications
- Manufacturer's Specifications

T3. Refrigerant Piping and Accessories

- Equipment location
- Piping arrangements
- Pipework accessories and location
- Mounting methods
- Noise and vibration prevention
- Pipework mounting and fastening

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REQUIRED SKILLS AND KNOWLEDGE

- Insulation
- Pipework installation techniques

T4. Pipe Selection and Sizing

- Sizing charts
- Correction factors
- Equivalent lengths
- Pressure drop
- Oversized & undersized pipe
- Refrigerant velocity
- Oil return
- Effect of system capacity

T5. Refrigerant Liquid Flow Controls

- Types
- Construction
- Operation
- Applications
- Selection

T6. Refrigerant Vapour Flow Controls

- Types
- Construction
- Operation
- Applications
- Selection

T7. Refrigeration System Controls

- Types
- Construction
- Operation
- Applications
- Selection

T8. System Capacity Controls

- Methods
- Components
- Operation
- Applications

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically.

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EVIDENCE GUIDE

Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Select refrigerant pipe/tube, accessories and associated controls as described in 8) and including:

A Arranging pipe work to comply with regulatory and functional requirements.

B Selecting appropriate type, size and quantity of piping and tubing

C Selecting refrigeration accessories that meets load requirements

D Selecting control devices that meet functional and regulatory requirements.

E Documenting pipe work arrangement, specification for items selected and reasons for the selections made

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in selecting refrigerant pipe/tube, accessories and associated controls.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED001B	Use basic computer applications relevant to a workplace'
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to the selection of refrigerant pipe/tube, accessories and associated controls for two different refrigeration systems.

These include the following; refrigerant pipe (quick selection method) and fittings, refrigeration flow controls, isolation/access valves, filter-dryers, sight glasses, accessories, thermostats, pressure controls and humidity controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers diagnosing, repairing faults and replacing faulty components in refrigeration and air conditioning systems, components, interconnecting circuits and equipment operating at voltages up to 1,000 V a.c. It encompasses working safely, reading electrical circuit diagrams, refrigeration, hydronic and air distribution system diagrams and manufacturers reference material, sketching diagrams from traced wiring and piping systems, applying logical fault finding procedures, conducting repairs, replacing components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

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Prerequisite Unit(s) **2)**

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage

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Prerequisite Unit(s) **2)**

installation wiring

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and rectify faults	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The nature of the fault is obtained from documentation and/or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.

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ELEMENT	PERFORMANCE CRITERIA	
	1.5	Sources of materials that may be required for the work are accessed in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety
2 Find faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live and operating system is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Fault finding is approached methodically drawing on knowledge of refrigeration and air conditioning systems using observation, measurement, calculations and comparison with normal system and component parameters/values.
	2.5	Faults beyond the scope of refrigeration and air conditioning work are identified.
	2.6	System components are removed/dismantled where necessary and parts stored to protect them against loss or damage
	2.7	Faulty components are rechecked and their fault status confirmed.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.9	Fault finding activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Repair fault	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Arrangements are made for appropriately competent and authorised person to rectify faults that are beyond the scope of refrigeration and air conditioning work.
	3.3	Equipment is checked as being isolated where necessary in strict accordance OHS requirements and procedures
	3.4	Materials required to rectify faults are sourced and obtained in accordance with established procedures.
	3.5	Repairs are affected efficiently without damage to other components or apparatus and using sustainable energy principles.
	3.6	Effectiveness of the repair is tested in accordance with established procedures.
	3.7	System is reassembled and finally tested to ensure it is operating safely, effectively and complies with relevant requirements.
4 Completion and report fault finding and rectification activities	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work area is cleaned and made safe in accordance with established procedures.
	4.3	Written justification is made for repairs to circuits/apparatus.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in refrigeration and air conditioning systems and components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ111A Refrigeration and air conditioning systems fault diagnosis and repair

Evidence shall show an understanding of refrigeration and air conditioning system fault diagnosis and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Preventative maintenance schedules and procedures.

T2 Normal and abnormal system and component operations including:

- Systems design operating conditions
- Overcharge and undercharge
- High and low evaporator superheat
- High and low condensing pressure
- High and low evaporation pressure
- High and low liquid sub-cooling
- Low air/water flow rate through condenser and evaporator
- Inefficient compressor
- Open, closed and short circuits in motors and controls

T3 Finding and rectify system faults

- Factors to consider in clarifying the nature of a fault including; initial fault report, confirmation of symptoms of the fault, comparison of symptoms with normal operation
- Effect to cause reasoning — assumptions of possible causes
- Methods for testing assumptions including; visual inspection, sectional testing, split-half tests, component isolation
- Dealing with intermittent faults caused by vibration, shock, changes in temperature and electromagnetic interference.
- Rectifying control system faults including adjustments, repairs and replacement of components, controls and accessories

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REQUIRED SKILLS AND KNOWLEDGE

T4 Diagnosing and rectifying faults on refrigeration and air conditioning systems including;

- Appliance refrigerated systems
- Cool room and freezer room systems
- Merchandising and display cabinets
- Residential air conditioning systems
- Package air conditioning systems

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence

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EVIDENCE GUIDE

need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in refrigeration and air conditioning systems and components as described in 8) and including:

    A Using methodical fault finding techniques

    B Finding faults efficiently

    C Rectifying faults without damage

    D Providing written justification for the rectifications undertaken

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in diagnosing and rectifying faults in refrigeration and air conditioning systems and components.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ113A	Commission air conditioning and refrigeration systems

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to diagnosing and rectifying faults in the following refrigeration air conditioning systems and components:

- Compressors
- Condensers
- Evaporators/cooling coils
- Refrigerant flow controls
- Refrigerant piping and accessories
- Refrigeration systems
- Cycling controls
- Safety controls
- Motors

At least one of the following apparatus:

- Water systems, which includes cooling towers, evaporative condensers, evaporative coolers, hot water systems, chilled water systems, pumps, piping and associated equipment
- Air distribution systems

At least three of the following systems

- cool rooms
- freezer rooms
- merchandising and display cabinets
- residential air conditioning systems
- packaged or commercial air conditioning systems
- industrial air conditioning systems
- domestic refrigerators and freezers

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ112A Diagnose and rectify faults in complex air conditioning/ refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers diagnosing and rectifying faults in complex refrigeration/air conditioning systems. It encompasses safe working practices, interpreting technical data, applying knowledge of complex refrigeration/air conditioning systems operating parameters to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003	Solve problems in extra-low voltage

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Prerequisite Unit(s) **2)**

B	single path circuits
UEENEEE105 A	Fix and secure electrotechnology equipment
UEENEEE107 A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137 A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems

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Prerequisite Unit(s) **2)**

UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose complex refrigeration/air conditioning systems faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Causes of the faults are identified and appropriately competent persons are engaged to rectify the fault

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ELEMENT	PERFORMANCE CRITERIA	
		where it is outside the scope of the refrigeration and air-conditioning system.
	2.7	Faults in system components of the system are rectified to raise the refrigeration/air conditioning systems to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report fault diagnosis and rectification activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in complex refrigeration/air conditioning systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ112A Complex refrigeration and air conditioning system fault finding and repair

Evidence shall show an understanding of fault finding and repairing complex refrigeration and air conditioning system, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Fault finding techniques

- Factors to consider in clarifying the nature of a fault encompassing:
  - initial fault report
  - confirmation of symptoms of the fault
  - comparison of symptoms with normal operation
- Effect to cause reasoning — assumptions of possible causes
- Methods for testing assumptions encompassing:
  - Visual inspection
  - Sectional testing
  - Split-half tests
  - Component isolation
- Dealing with intermittent faults

Note: Typical causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference.

T2 Refrigeration system analysis

- Pressure Enthalpy definitions
  - high pressure & low pressure refrigerants
  - triple point of new refrigerants
  - glide of trinary blends
  - differential evaporation of refrigerant blends
  - variable refrigerant volume
- Refrigeration cycle

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REQUIRED SKILLS AND KNOWLEDGE

- expansion process
- vaporising process
- compression process
- condensing process
- compression ratio

- Enthalpy processes
  - co-efficient of performance
  - effect of suction temperature on cycle efficiency
  - effect of condensing temperature on cycle efficiency
- Actual refrigerating cycles
  - design operating conditions
  - effects of superheating suction vapour
  - superheating without useful cooling
  - superheating that produces useful cooling
  - superheating in suction piping outside the refrigerated space
  - superheating the vapour inside the refrigerated space
  - effects of subcooling the liquid
  - effects liquid - suction heat exchangers
  - effects of pressure losses resulting from friction
- Refrigeration cycle faults
  - symptoms and causes
  - measurements and fault confirmation tests

T3 Air conditioning system analysis

- Psychrometric chart
  - properties, definitions and units
  - plotting conditions
    - RA, SA, OA, MA
- Psychometric processes
  - heating
  - cooling only
  - cooling and dehumidification
  - cooling , dehumidification and reheat
- Design operating conditions
  - indoor and outdoor wet and dry bulb temperatures
  - volume flow rate supply, return and outdoor air
- Air conditioning system faults
  - symptoms and causes
  - measurements and fault confirmation tests

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REQUIRED SKILLS AND KNOWLEDGE

T4 Power and control system analysis

- power and control circuit diagrams
- sequence of operation
- manufacturers diagrams, specifications and instructions
- power and control circuit faults
  - symptoms and causes
  - measurements and fault confirmation tests

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material

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EVIDENCE GUIDE

carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in complex refrigeration/air conditioning systems as described in 8) and including:

A Applying logical diagnostic methods

B Using fault scenarios to test the cause of system faults

C Identifying faults and competency needed to rectify them

D Rectifying faults in system controls

E Verifying that the system operates correctly

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in diagnosing and rectifying faults in complex refrigeration/air conditioning systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to diagnosing and rectifying at least four faults in complex refrigeration/air conditioning systems, incorporating multiple major components (i.e. compressors, condenser, or evaporators) circuits or systems and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ113A Commission air conditioning and refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers commissioning of refrigeration and air conditioning systems. It encompasses working safely and to standards to commission the whole system and includes pre-commissioning tests, starting up the system, optimizing the refrigerant charge, basic air and water balancing and adjustment, checking and adjusting components and controls to ensure its efficient and balanced operation, and completing commissioning documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEE101	Apply Occupational Health and Safety

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Prerequisite Unit(s) **2)**

A	regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring

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Prerequisite Unit(s) **2)**

UEENEEP017 A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to commission refrigeration and air conditioning systems	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.

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ELEMENT	PERFORMANCE CRITERIA	
	1.4	Commissioning work is appropriately sequenced in accordance with job schedule
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	The extent of the system and location of system components is determined from site inspection and/or job specifications and diagrams
	1.7	System control setting and operating parameters are determined from job specifications and requirements.
	1.8	Tools, equipment and testing devices needed to commission the system are obtained in accordance with established procedures and checked for correct operation and safety
	1.9	Pre commissioning checks are undertaken to ensure all components are in place and secure.
	1.10	The need to test or measure a live and operating system is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
2 Commission refrigeration systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Refrigeration system pressure controls, valves and regulators are adjusted to their required settings.
	2.4	Testing/measuring devices are used to observe the operation of refrigeration system and fine adjustments of controls are made as necessary.
	2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.7	Commissioning is conducted efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Commission air handling systems	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	3.3	Air distribution system dampers are adjusted to avoid air restrictions and allow maximum return volumes.
	3.4	Balancing the air distribution system is carried out methodically drawing on knowledge of air distribution requirements using measured and calculated values of system parameters.
	3.5	Air distribution system is balanced to ensure the flow rates meet the specified requirements for each outlet.
	3.6	Testing/measuring devices are used to observe the operation of air conditioning system components and fine adjustments of controls are made as necessary.
	3.7	Testing/measuring devices are used to observe the operation of refrigeration system and fine adjustments of controls are made as necessary. Note: Components can include fans, chillers, condensers, coils and heat exchangers, boilers and controls
	3.8	Testing/measuring devices are used to observe the operation of the hydronic system and fine adjustments of controls are made as necessary. Note: Components can include chillers, condensers,

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ELEMENT	PERFORMANCE CRITERIA	
		coils and heat exchangers, boilers, cooling towers, pumps and controls
	3.9	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	3.10	Unexpected situations are dealt with safely and with the approval of an authorised person.
	3.11	Commissioning is conducted efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
4 Complete and document commissioning work	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.
	4.3	Results of commissioning are documented including final operating parameters and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and commissioning refrigeration and air conditioning systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ113A Refrigeration and air conditioning commissioning procedures and requirements

Evidence shall show an understanding of commissioning refrigeration and air conditioning systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Refrigeration systems operation and performance including refrigeration effect; flow rate; specific volume; system capacity; discharge temperature; total heat rejection; heat of compression and refrigerant properties and effects

T2 Compressor operation and performance including:

- Compressor drive methods including belt drives; direct drives; speed vs. pulley size and alignment requirements.
- Compressor piston displacement; compressor displacement; compression ratio; compressor efficiency
- Methods of system capacity control including compressor unloading; refrigerant bypass; air flow; water flow; multiple units and compressor speed.

T3 Air conditioning testing/measuring devices applicable to air volume, air velocity, air pressure, air temperature, air relative humidity and sound levels.

T4 System design cooling/heating capacity and conditions from:

- System design specifications and drawings
- Manufacturers specifications and manuals

T5 Pre-commissioning inspections and checks

T6 Testing, measurements and adjustments of the system

- Major components
- Refrigerant flow controls and accessories
- Safety and cycling controls
- Refrigerant charge
- Air/water flow quantities

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REQUIRED SKILLS AND KNOWLEDGE

T7 System operating conditions and cooling/heating capacity vs system design conditions and cooling/heating capacity

T8 Marking up “as installed” drawings

T9 Commissioning reports

T10 Commissioning refrigeration and air conditioning systems including;

- Appliance refrigerated systems
- Cool room and freezer room systems
- Merchandising and display cabinets
- Residential air conditioning systems
- Package air conditioning systems

T11 Retrofitting systems with a replacement refrigerant

- Systems and refrigerants suitable for retrofitting
- Retrofitting a refrigerant into a system
- Procedures for modify an existing system to meet the requirements of the alternative refrigerant encompassing:
  - Evaluating performance of a system prior to being retrofitted.
  - Testing refrigerant oil in accordance with industry standard.
  - Reclaiming and evacuate system.
  - Removing and replacing components.
  - Pressure testing, evacuating and charging.
- Procedures for commissioning a retrofitted system to the prescribed standard
- Evaluating key performance factors of a system before and after a retrofit.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over

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EVIDENCE GUIDE

time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Commission refrigeration and air conditioning systems and components as described in 8) and including:

    A Using methodical commissioning techniques

    B Commissioning efficiently

    C Optimising system performance and efficiency

    D Providing written commissioning reports

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in commissioning refrigeration and air conditioning systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to commissioning the following refrigeration and air conditioning systems and components:

- Compressors
- Condensers
- Evaporators/cooling coils
- Refrigerant flow controls
- Refrigerant piping and accessories
- Refrigeration systems
- Cycling controls
- Safety controls
- Motors

At least one of the following apparatus:

- Water systems, which includes cooling towers, evaporative condensers, evaporative coolers, hot water systems, chilled water systems, pumps, piping and associated equipment
- Air distribution systems

At least three of the following systems

- cool rooms
- freezer rooms
- merchandising and display cabinets
- residential air conditioning systems
- packaged or commercial air conditioning systems
- industrial air conditioning systems
- domestic refrigerators and freezers

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ114A Resolve problems in hydronic systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers resolving problems in hydronic systems. It encompasses working safely and to standards, applying knowledge of the components and resolving problems in hydronic systems, using effective problem solving techniques and documenting solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101 A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102	Fabricate, assemble and dismantle

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Prerequisite Unit(s) **2)**

A	utilities industry components
UEENEEE003 B	Solve problems in extra-low voltage single path circuits
UEENEEE105 A	Fix and secure electrotechnology equipment
UEENEEE107 A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137 A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits

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Prerequisite Unit(s) **2)**

UEENEEP012 A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017 A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to resolve problems in hydronic systems	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are noted and established risk control

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ELEMENT	PERFORMANCE CRITERIA	
		measures are implemented.
	1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Resolve problems in hydronic systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Problems are approached methodically drawing on operational knowledge of hydronic systems using observation, measurement, calculations and comparison with normal operating values of system and components.
	2.5	Information needed to resolve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to resolve problems are system specifications, as-installed drawings, maintenance and service records and measured and calculated values of component operating parameters.
	2.6	Problems are dealt with safely and with the approval of an authorised person.
	2.7	Problems are resolved without damage to apparatus,

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ELEMENT	PERFORMANCE CRITERIA	
		circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities in hydronic systems	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to resolve problems is documented
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in hydronic systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ114A **Hydronic systems**

Evidence shall show an understanding of hydronic systems used for refrigeration and/or air conditioning applications, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 System characteristics, design features, applications, construction, components and typical layout arrangements.

T2 Operating and control principles

T3 Maintenance schedules

T4 System faults and testing methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for

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EVIDENCE GUIDE

apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Resolve problems in hydronic systems as described in 8) and including:

A Using methodical fault finding techniques

B Assessing relevant information

C Solving problems effectively

D Providing written justification for the solutions used

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in solving problems in hydronic systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in solving at least three operational problems related to hydronic systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ115A Resolve problems in beverage dispensers

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers resolving problems in beverage dispensers. It encompasses working safely and to standards, applying knowledge of the components and operation of beverage dispensers, using effective problem resolving techniques and documenting solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s)

2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage

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Prerequisite Unit(s)	**2)**	
		refrigeration circuits
	UEENEEP012 A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
	UEENEEP017 A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to resolve problems in beverage dispensers	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
	1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Resolve problems in beverage dispensers	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Problems are approached methodically drawing on operational knowledge of beverage dispensers systems using observation, measurement, calculations and comparison with normal operating values of system and components.
	2.5	Information needed to resolve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to resolve problems are system specifications, as-installed drawings, maintenance and service records and measured and calculated values of component

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ELEMENT	PERFORMANCE CRITERIA	
		operating parameters.
	2.6	Problems are dealt with safely and with the approval of an authorised person.
	2.7	Problems are resolved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem resolving activities	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to resolve problems is documented
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in beverage dispensers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ115 Beverage dispensers

Evidence shall show an understanding of refrigerated beverage dispensers, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 System characteristics, design features, applications, construction, components, and typical layout arrangements.

T2 Operating and control principles

T3 Maintenance schedulesd) System faults and testing methods

T4 Pure food act and HACCP

T5 Dispensed beverage product knowledge:

Note: Examples are beer, wine, spirits, soft drinks, and the like

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably

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EVIDENCE GUIDE

gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Resolve problems in beverage dispensers as described in 8) and including:

    A Using methodical problem resolving techniques

    B Accessing relevant information

    C Resolving problems effectively

    D Providing written justification for the solutions used

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in resolving problems in beverage dispensers.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in resolving at least three operational problems related to refrigerated beverage dispensers.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ116A Resolve problems in transport refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers resolving problems in transport refrigeration systems. It encompasses working safely and to standards, applying knowledge of the components and operation of transport refrigeration systems, using effective problem solving techniques and documenting solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage

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Prerequisite Unit(s) **2)**

	refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to resolve problems in transport refrigeration systems	1.1 OHS procedures for a given work area are identified, identified, obtained and understood
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3 Safety hazards which have not previously been identified are

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ELEMENT	PERFORMANCE CRITERIA
	noted and established risk control measures are implemented.
	1.4 The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5 Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6 Sources of materials that may be required for the work are accessed in accordance with established procedures.
	1.7 Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Resolve problems in transport refrigeration systems	2.1 OHS risk control measures and procedures for carrying out the work are followed.
	2.2 The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4 Problems are approached methodically drawing on operational knowledge of transport refrigeration systems using observation, measurement, calculations and comparison with normal operating values of system and components.
	2.5 Information needed to resolve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to resolve problems are system specifications, as-installed drawings, maintenance and service records and measured and calculated values of component operating parameters.
	2.6 Problems are dealt with safely and with the approval of an authorised person.
	2.7 Problems are resolved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA
3 Complete work and document problem resolving activities.	3.1 OHS risk control work completion measures and procedures are followed.
	3.2 Work site is cleaned and made safe in accordance with established procedures.
	3.3 Justification for solutions used to resolve problems is documented
	3.4 Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and resolving problems in transport refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ116 Transport refrigeration systems

Evidence shall show an understanding of transport refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 System characteristics, design features, applications, construction, components and typical layout arrangements.

T2 Operating and control principles

T3 Maintenance schedules

T4 System faults and testing methods

T5 External power sources

Note: Examples are diesel/petrol engines, electrical, dual power supplies

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that

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EVIDENCE GUIDE

can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Resolve problems in transport refrigeration systems as described in 8) and including:

A	Using methodical problem resolving techniques
B	Accessing relevant information
C	Resolving problems effectively
D	Providing written justification for the solutions used
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in resolving problems in transport refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in resolving at least three operational problems related to transport refrigeration systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ117A Resolve problems in ultra-low temperature refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers resolving problems in ultra-low temperature refrigeration systems, including compound and cascade systems. It encompasses working safely and to standards, applying knowledge of the components and operation of ultra-low temperature refrigeration systems, using effective problem resolving techniques and documenting solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage

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Prerequisite Unit(s) **2)**

	refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to Resolve problems in ultra-low temperature refrigeration systems.	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
	1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Resolve problems in ultra-low temperature refrigeration systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Problems are approached methodically drawing on operational knowledge of Ultra-low temperature refrigeration systems using observation, measurement, calculations and comparison with normal operating values of system and components.
	2.5	Information needed to resolve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to resolve problems are system specifications, as-installed drawings, maintenance and service records and

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ELEMENT	PERFORMANCE CRITERIA	
		measured and calculated values of component operating parameters.
	2.6	Problems are dealt with safely and with the approval of an authorised person.
	2.7	Problems are resolved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem resolving activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to resolve problems is documented
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and resolving problems in Ultra-low temperature refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ117A Ultra-low temperature refrigeration systems

Evidence shall show an understanding of ultra-low temperature refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 System characteristics, design features, applications, construction, components and typical layout arrangements.

T2 Operating and control principles

T3 Maintenance schedules

T4 System faults and testing methods

T5 Suitability of refrigerants for each application

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over

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EVIDENCE GUIDE

time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Resolve problems in ultra-low temperature refrigeration systems as described in 8) and including:

    A Using methodical problem resolving techniques

    B Accessing relevant information

    C Resolving problems effectively

    D Providing written justification for the solutions used

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in resolving problems in Ultra-low temperature refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in resolving at least three operational problems related to ultra-low temperature refrigeration systems.

Ultra-low temperature refrigeration systems cover compound and cascade systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ118A Resolve problems in post mix refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers resolving problems in post mix refrigeration systems. It encompasses working safely and to standards, applying knowledge of the components and operation of post mix refrigeration systems, using effective problem resolving techniques and documenting solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control

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Prerequisite Unit(s)	**2)**	
		systems
	UEENEEJ194A	Solve problems in low voltage refrigeration circuits
	UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
	UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
	or	
	UEENEEJ155A	Service refrigeration appliances
	UEENEEJ154A	Find and rectify faults in appliance control systems and devices
	UEENEEJ162A	Recover, pressure test, evacuate, charge and leak test refrigerants appliances
	UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
	UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances
	AND	
	UEENEEG006A	Solve problems in single and three phase low voltage machines
	UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
	UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
	UEENEEE104A	Solve problems in d.c. circuits
	UEENEEE105A	Fix and secure electrotechnology equipment

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Prerequisite Unit(s) **2)**

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
or	
UEENEEJ155A	Service refrigeration appliances
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE003B	Solve problems in extra-low voltage single path circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to resolve problems in post mix refrigeration systems.	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
	1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

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ELEMENT	PERFORMANCE CRITERIA	
		others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Resolve problems in post mix refrigeration systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Problems are approached methodically drawing on operational knowledge of post mix refrigeration systems using observation, measurement, calculations and comparison with normal operating values of system and components.
	2.5	Information needed to resolve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to resolve problems are system specifications, as-installed drawings, maintenance and service records and measured and calculated values of component operating parameters.
	2.6	Problems are dealt with safely and with the approval of an authorised person.
	2.7	Problems are resolved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and document problem resolving activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to resolve problems is documented
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and resolving problems in post mix refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ118A **Post mix refrigeration systems**

Evidence shall show an understanding of post mix refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 System characteristics, design features, applications, construction, components and typical layout arrangements.

T2 Operating and control principles

T3 Maintenance schedules

T4 System faults and testing methods

T5 Pure food act and HACCP

T6 Dispensed beverage product knowledge:

Note: Examples are wine, spirits, soft drinks, and the like

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to

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assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Resolve problems in post m ix refrigeration systems as described in 8) and including:

    A Using methodical problem resolving techniques

    B Accessing relevant information

    C Resolving problems effectively

    D Providing written justification for the solutions used

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in resolving problems in post mix refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in resolving at least three operational problems related to post mix refrigeration systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ119A Resolve problems in ice making systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers resolving problems in ice making systems. It encompasses working safely and to standards, applying knowledge of the components and operation of ice making systems, using effective problem resolving techniques and documenting solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s)

2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage

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Prerequisite Unit(s) **2)**

	refrigeration circuits
UEENEEP012 A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017 A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to resolve problems in ice making systems.	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
	1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Resolve problems in ice making systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Problems are approached methodically drawing on operational knowledge of ice making systems using observation, measurement, calculations and comparison with normal operating values of system and components.
	2.5	Information needed to resolve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to resolve problems are system specifications, as-installed drawings, maintenance and service records and measured and calculated values of component

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ELEMENT	PERFORMANCE CRITERIA	
		operating parameters.
	2.6	Problems are dealt with safely and with the approval of an authorised person.
	2.7	Problems are resolved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem resolving activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to resolve problems is documented
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and resolving problems in ice making systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ119A **Ice making systems**

Evidence shall show an understanding of ice making systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 System characteristics, design features, applications, construction, components and typical layout arrangements.

T2 Operating and control principles

T3 Maintenance schedules

T4 System faults and testing methods

T5 Pure food act and HACCP

T6 Dispensed beverage product knowledge

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably

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gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Resolve problems in ice making systems as described in 8) and including:

    A Using methodical problem resolving techniques

    B Accessing relevant information

    C Resolving problems effectively

    D Providing written justification for the solutions used

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in resolving problems in ice making systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in resolving at least three operational problems related to ice making systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ120A Resolve problems in industrial refrigeration systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers solving problems in industrial refrigeration systems. It encompasses working safely and to standards, applying knowledge of the components and operation of industrial refrigeration systems, using effective problem solving techniques and documenting solutions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and

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License to practice **3)**

safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories

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Prerequisite Unit(s) **4)**

UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify fault motors and associated controls in refrigeration and air conditioning
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEP013A	Disconnect / reconnect control devices connected to low voltage installation wiring
UEENEEP016A	Locate and rectify faults in low voltage appliances using set procedures

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to solve problems in industrial refrigeration systems.	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
	1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Solve problems in industrial refrigeration systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Problems are approached methodically drawing on operational knowledge of industrial refrigeration systems using observation, measurement, calculations and comparison with normal operating values of system and components.
	2.5	Information needed to solve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to solve problems are system specifications, as-installed drawings, maintenance and service records and measured and calculated values of component operating parameters.
	2.6	Problems are dealt with safely and with the approval of an authorised person.
	2.7	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and document problem solving activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve problems is documented
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in industrial refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ120A **Industrial refrigeration systems**

Evidence shall show an understanding of industrial refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

System characteristics, design features, applications, construction, components and typical layout arrangements.

- Operating and control principles
- Maintenance schedules
- System faults and testing methods
- Secondary refrigerants and systems

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in industrial refrigeration systems as described in 8) and including:

A Using methodical problem solving techniques

B Accessing relevant information

C Solving problems effectively

D Providing written justification for the solutions

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	used
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in solving problems in industrial refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

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Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE009B	Comply with scheduled and preventative maintenance program processes

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in solving at least three operational problems related to industrial refrigeration systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Refrigeration and Air Conditioning

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UEENEEJ121A Monitor and adjust refrigeration energy management systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the setting-up and adjusting energy management systems on refrigeration systems for effective energy use. It encompasses safe working practices, system parameter testing and analysis, adjusting equipment and controls, following procedures and documenting final operating parameters and settings.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s)

2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **2)**

UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control

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Prerequisite Unit(s) **2)**

	systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to monitor and adjust energy management systems on refrigeration systems.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.5	System energy parameters are identified by reviewing system specifications and component technical data.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
	1.7	Preparatory work is checked to ensure no damage has occurred and complies with requirements
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	1.9	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
2 Monitor and adjust energy management systems on refrigeration systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular system.
	2.3	Monitoring and adjustments are made to equipment components and controls to provide effective energy use in accordance with system specifications and regulatory requirements.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.6	Monitoring and adjusting is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Completion and report monitoring adjusting activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Monitoring and adjustment settings are documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and monitoring and adjusting energy management systems on refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ121A Energy management systems for commercial refrigeration

Evidence shall show an understanding of energy management systems for commercial refrigeration, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Functions of a commercial refrigeration E.M.S.

- General control function
- Inputs
- Outputs
- Communications
- Graphing
- Supervising
- Data logging
- Scheduling
- Alarms
- Power consumption

T2 E.M.S. control components

- Identify components
- Pressure sensors
- Temperature sensors
- Time clocks
- Humidity sensors
- Liquid level sensors
- Leak detector sensor
- State the function and operating parameters of components
- Pressure sensors
- Temperature sensors
- Time clocks

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REQUIRED SKILLS AND KNOWLEDGE

- Humidity sensors
- Liquid level sensors
- Leak detector sensors

T3 Installation requirements and consideration

- Installation of controller(s)
- Installation of refrigerant leak detector
- Systems
- Installation of accessory boards
- Installation of pressure transducers & wiring
- Installation of temperature sensors & wiring
- Control wiring considerations

T4 System design and applications

- Select control components to suit given applications
- Determine system operating parameters
- Pressure sensors
- Temperature sensors
- Time clocks
- Humidity sensors
- Liquid level sensors
- Leak detector sensors
- Defrost
- Alarm panel

T5 Programming a control system

- Display terminal and keypad functions
- Calibration of sensors
- Changing original settings
- Program a given set of parameters to suit an application

T6 Component testing and fault finding

- Trouble shooting
- Testing of components

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement

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EVIDENCE GUIDE

and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria

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EVIDENCE GUIDE

shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Monitor and adjust energy management systems on refrigeration systems as described in 8) and including:

A Identifying system energy parameters

B Monitoring and adjusting system components and controls to provide effective energy use

C Ensuring system energy use is accordance with requirements

D Documenting adjustment settings with established procedures

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in monitoring and adjusting energy management systems on refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to monitoring and adjusting two different types of energy management systems for refrigeration systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ122A Diagnose faults in complex HVAC /refrigeration control systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers diagnosing and rectifying faults in complex heating, ventilation and air conditioning (HVAC) or refrigeration control systems. It encompasses safe working practices, interpreting technical data, applying knowledge of complex refrigeration or heating, ventilation and air conditioning (HVAC) control systems operating parameters to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ112A	Diagnose and rectify faults in complex air conditioning/ refrigeration systems
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **2)**

UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194	Solve problems in low voltage refrigeration

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Prerequisite Unit(s) **2)**

A	circuits
UEENEEP012 A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017 A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024 A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025 A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults.	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose control system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Causes of the faults are identified and appropriately competent persons are engaged to rectify the fault

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ELEMENT	PERFORMANCE CRITERIA	
		where it is outside the scope of the control system.
	2.7	Faults in system components of the system are rectified to raise the refrigeration or heating, ventilation air conditioning systems to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report fault diagnosis and rectification activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing faults in complex refrigeration or HVAC control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ122A Complex HVAC/Refrigeration control systems

Evidence shall show an understanding of complex HVAC/Refrigeration control system fault finding, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Control fundamentals

- control terminology
- refrigeration system characteristics
- HVAC system characteristics
- control system characteristics
- control system components
- control system diagrams and symbols
- product knowledge

T2 Types of control equipment

- electrical:
  - classification of circuits
  - two position control
  - floating control
  - sensors
  - controllers
  - flow control devices
  - control systems diagrams
- electronic:
  - operating principles
  - sensors
  - controllers
  - control system diagrams

T3 Digital Control Systems

- Computer based control fundamentals

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REQUIRED SKILLS AND KNOWLEDGE

- Definitions
- Principles
- Controller configuration
  - Equipment
  - Zone level controllers
  - System level controllers
- Controller software
  - Operating software
  - Application software
- Controller programming
  - System diagrams
  - Control diagrams
  - Configuration
  - Programming
  - Initialisation
  - EMS, BMS
  - SCADA system
  - Lan, Bacnet

T4 Control systems applications

- refrigeration
- air conditioning
  - air handling system controls
  - ventilation
  - heating
  - building airflow system control
  - airflow control
  - singles and multi -zones
  - chiller/boiler and distribution system control (chilled water, boiler, distribution systems)

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

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EVIDENCE GUIDE

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work

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EVIDENCE GUIDE

function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose faults in complex refrigeration or HVAC control systems as described in 8) and including:

    A Applying logical diagnostic methods

    B Using fault scenarios to test the cause of system faults

    C Identifying faults and competency needed to rectify them

    D Rectifying faults in system controls

    E Verifying that the system operates correctly

    F Documenting fault rectification

    G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly

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EVIDENCE GUIDE

identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in diagnosing faults in complex refrigeration or HVAC control systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to diagnosing and rectifying at least four faults in complex refrigeration or HVAC control systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ123A Commission complex (HVAC) heating, ventilation and air conditioning systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the setting-up and adjusting complex (HVAC) heating, ventilation and air conditioning systems for optimum performance. It encompasses safe working practices, system parameter testing and analysis, adjusting equipment and controls, following procedures and documenting final operating parameters and settings.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ112A	Diagnose and rectify faults in complex air conditioning/ refrigeration systems
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems

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Prerequisite Unit(s) **2)**

UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to commission complex heating, ventilation and air conditioning systems	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.5	System operating parameters are identified by reviewing system specifications and component technical data.

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.7	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
		1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		1.9	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
2	Commission complex heating, ventilation and air conditioning systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular system.
		2.3	Measurements and adjustments are made to equipment components and controls to provide optimum system performance in accordance with system specifications and regulatory requirements.
		2.4	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
		2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.6	Commissioning is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3	Completion and report commissioning activities.	3.1	OHS risk control work completion measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with

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ELEMENT	PERFORMANCE CRITERIA	
		established procedures.
	3.3	Adjustment settings are documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and commissioning complex heating, ventilation and air conditioning (HVAC) systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ123A Complex HVAC system commissioning

Evidence shall show an understanding of complex HVAC system commissioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Commissioning fundamentals

- building specifications/requirements/responsibilities
- design and as installed drawings
- building codes
- local government regulations
- design conditions
- pre – commissioning checks
- calibration of instruments
- commissioning procedures
- data collection and recording, documentation
- reporting procedures

T2 Air systems

- factors affecting the design of ductwork systems
- types of ductwork systems
- static, velocity and total pressure
- air testing and balancing
- air flow
- pressure
- temperature

T3 Fans

- types and characteristics
- fan laws
- fan and system curves

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REQUIRED SKILLS AND KNOWLEDGE

- fan testing

T4 Air balancing

- equipment, instruments and procedures
- leakage testing

T5 Overview of noise in duct systems

- noise sources in duct systems
- attenuation
- methods of control

T6 System capacity calculations

T7 Hydronic systems

- hydronic instruments
- fluid flow
- pumps: pump curves and system curves
- pump testing
- capacity calculations

T8 Plant and equipment

- controls
- heat exchangers
- chillers
- boilers
- cooling towers

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over

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EVIDENCE GUIDE

time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able

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to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Commissioning complex heating, ventilation and air conditioning (HVAC) systems as described in 8) and including:

A Identifying system design operating parameters

B Measuring and adjusting system components and controls to provide optimum system performance

C Ensuring system operates within regulatory requirements

D Documenting adjustment settings with established procedures

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with

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performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in commissioning complex heating, ventilation and air conditioning (HVAC) systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to commissioning two different types of complex heating, ventilation and air conditioning systems, incorporating multiple major components (i.e. compressors, condenser or evaporators) circuits or systems and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ124A Commission refrigeration/ air conditioning hydronic systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the setting-up and adjusting hydronic systems for refrigeration and/or air conditioning optimum performance. It encompasses safe working practices, system parameter testing and analysis, adjusting equipment and controls, following procedures and documenting final operating parameters and settings.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ112A	Diagnose and rectify faults in complex air conditioning/ refrigeration systems
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and

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Prerequisite Unit(s)	**2)**	
		air conditioning systems
	UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
	UEENEEJ194A	Solve problems in low voltage refrigeration circuits
	UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
	UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
	UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
	UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to commission hydronic systems for refrigeration/air conditioning	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.5	System operating parameters are identified by reviewing system specifications and component technical data.

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.7	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
		1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		1.9	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
2	Commission hydronic systems for refrigeration/air conditioning.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular system.
		2.3	Measurements and adjustments are made to equipment components and controls to provide optimum system performance in accordance with system specifications and regulatory requirements.
		2.4	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
		2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.6	Commissioning is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA	
3 Completion and report commissioning activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Adjustment settings are documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and commissioning hydronic systems for refrigeration and/or air conditioning.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ124A Hydronic system commissioning

Evidence shall show an understanding of hydronic system commissioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Commissioning fundamentals

- building specifications/requirements/responsibilities
- design and as installed drawings
- building codes
- local government regulations
- design conditions
- pre – commissioning checks
- calibration of instruments
- commissioning procedures
- data collection and recording, documentation
- reporting procedures

T2 Hydronic systems operation

- closed/open systems
- pump head/lift, static head (high rise building)
- system friction losses
- nett positive suction head
- system curves

T3 Pumps

- types
- selection criteria
- performance characteristics
- pump curves and system curves
- pump testing

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REQUIRED SKILLS AND KNOWLEDGE

- capacity calculations
- bladder tanks
- coil characteristics
- heat exchangers: plate, shell and tube, tube in tube
- flow measurements: types
- flow switchers
- cooling towers: elementary cooling thermodynamics and types

T4 Valves - flow control devices

- types and applications
- balancing valves
- throttling characteristics
- flow measurements
- selection and applications

T5 Piping systems

- balancing and commissioning
- air venting
- water treatment
- vacuum breaking and air breaks

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum,

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the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Commission hydronic systems for refrigeration and/or air conditioning systems as described in 8) and including:

A Identifying system operating parameters

B Measuring and adjusting system components and controls to provide optimum system performance

C Ensuring system operates within regulatory requirements

D Documenting adjustment settings with established procedures

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in commissioning hydronic systems for refrigeration and/or air conditioning.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to commissioning two different hydronic systems for refrigeration and/or air conditioning systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ125A Commission complex refrigeration systems and equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the setting-up and adjusting complex refrigeration systems for optimum performance. It encompasses safe working practices, system parameter testing and analysis, adjusting equipment and controls, following procedures and documenting final operating parameters and settings.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ112A	Diagnose and rectify faults in complex air conditioning/ refrigeration systems
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and

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Prerequisite Unit(s)	**2)**	
		air conditioning systems
	UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
	UEENEEJ194A	Solve problems in low voltage refrigeration circuits
	UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
	UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
	UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
	UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to commission complex refrigeration systems.	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.5	System operating parameters are identified by reviewing system specifications and component technical data.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and

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ELEMENT	PERFORMANCE CRITERIA	
		safety.
	1.7	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	1.9	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
2 Commission complex refrigeration systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular system.
	2.3	Measurements and adjustments are made to equipment components and controls to provide optimum system performance in accordance with system specifications and regulatory requirements.
	2.4	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.6	Commissioning is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Completion and report commissioning activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Adjustment settings are documented and an appropriate person or persons notified in accordance with

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ELEMENT	PERFORMANCE CRITERIA
	established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and commissioning complex refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01_EJ125A Complex refrigeration systems commissioning

Evidence shall show an understanding of complex refrigeration systems commissioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Commissioning fundamentals

- building specifications/requirements/responsibilities
- design and as installed drawings
- building codes
- local government regulations
- design conditions
- pre – commissioning checks
- calibration of instruments
- commissioning procedures
- data collection and recording, documentation
- reporting procedures

T2 Air Systems (excluding air balancing)

- instruments
- air flow
- pressure
- temperature
- fan testing
- leakage testing
- system capacity calculations

T3 Hydronic systems

- hydronic instruments
- fluid flow
- pumps: pump curves and system curves

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REQUIRED SKILLS AND KNOWLEDGE

- pump testing
- capacity calculations

T4 Refrigeration Systems

- AS1677
- Code of practice
- pressure testing
- evacuation
- charging
- control setting
- commissioning reports
- system performance and capacity

T5 Plant and equipment

- controls
- heat exchangers
- chillers
- boilers
- cooling towers

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the

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competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Commission complex refrigeration systems as described in 8) and including:

A Identifying system operating parameters

B Measuring and adjusting system components and controls to provide optimum system performance

C Ensuring system operates within regulatory requirements

D Documenting adjustment settings with established procedures

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in commissioning complex refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to commissioning two different types of complex refrigeration systems, incorporating multiple major components (i.e. compressors, condenser or evaporators) circuits or systems and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ126A Commission complex refrigeration/air conditioning control systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the setting-up and adjusting complex control systems for refrigeration or air conditioning optimum performance. It encompasses safe working practices, system parameter testing and analysis, adjusting equipment and controls, following procedures and documenting final operating parameters and settings.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ122A	Diagnose faults in complex HVAC /refrigeration control systems
UEENEEJ112A	Diagnose and rectify faults in complex air conditioning/ refrigeration systems
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety

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Prerequisite Unit(s)	**2)**	
		regulations, codes and practices in the workplace
	UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
	UEENEEE003B	Solve problems in extra-low voltage single path circuits
	UEENEEE105A	Fix and secure electrotechnology equipment
	UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
	UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
	UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
	UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
	UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
	UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
	UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
	UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
	UEENEEJ110A	Select refrigerant piping, accessories and associated controls
	UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
	UEENEEJ113A	Commission air conditioning and refrigeration systems

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Prerequisite Unit(s) **2)**

UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to commission complex control systems for refrigeration and air conditioning.	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.5	System operating parameters are identified by reviewing system specifications and component technical data.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and

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ELEMENT	PERFORMANCE CRITERIA	
		safety.
	1.7	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	1.9	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
2 Commission complex control systems for refrigeration and air conditioning.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Testing/measuring devices are connected and set up in accordance with requirements for a particular system.
	2.3	Measurements and adjustments are made to equipment components and controls to provide optimum system performance in accordance with system specifications and regulatory requirements.
	2.4	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.6	Commissioning is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Completion and report commissioning activities.	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Adjustment settings are documented and an appropriate person or persons notified in accordance with

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ELEMENT	PERFORMANCE CRITERIA
	established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and commissioning complex control systems for refrigeration/air conditioning.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ126A Complex refrigeration/HVAC control system commissioning

Evidence shall show an understanding of complex HVAC/Refrigeration control system commissioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Commissioning fundamentals

- building specifications/requirements/responsibilities
- design and as installed drawings
- building codes
- local government regulations
- design conditions
- pre – commissioning checks
- calibration of instruments
- commissioning procedures
- data collection and recording, documentation
- reporting procedures

T2 Control fundamentals

- control terminology
- refrigeration system characteristics
- HVAC system characteristics
- control system characteristics
- control system components
- control system diagrams and symbols
- product knowledge
- T3 Commissioning various types of control equipment
- electrical:
  - sensors
  - controllers

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REQUIRED SKILLS AND KNOWLEDGE

- flow control devices
- control systems diagrams
- electronic:
  - sensors
  - controllers
  - control system diagrams

T4 Digital Control Systems

- System diagrams
- Control diagrams
- Configuration
- Programming
- Initialisation
- EMS, BMS
- SCADA system
- Lan, Bacnet

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry

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EVIDENCE GUIDE

and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Commission complex control systems for refrigeration/air conditioning as described in 8) and including:

A Identifying system operating parameters

B Measuring and adjusting system components and controls to provide optimum system performance

C Ensuring system operates within regulatory requirements

D Documenting adjustment settings with established procedures

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in commissioning complex control systems for refrigeration/air conditioning.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to commissioning two different complex control systems for refrigeration or air conditioning.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the determination of the thermodynamic parameters of refrigeration and air conditioning systems. It encompasses working safely, determining thermodynamic parameters of using measurement and basic calculation methods and documenting results.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training or institutional based delivery at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

OR

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage

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Prerequisite Unit(s)	**2**)
	composite appliances using set procedures
	UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
	UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to determine thermodynamic parameters of refrigeration and air conditioning	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT		PERFORMANCE CRITERIA	
	systems		
		1.3	The expected operating conditions are obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Tools, equipment and testing devices needed to determine the basic operating conditions are obtained and checked for correct operation and safety
		1.6	The expected operating conditions are obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
2	Determine thermodynamic parameters of refrigeration and air conditioning systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Measurement of thermodynamic system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
		2.3	System is checked and isolated where necessary, in strict accordance OHS requirements and procedures
		2.4	Established procedures are used to determine actual and specified range of thermodynamic parameters from measured and calculated values as they apply to particular refrigeration or air conditioning systems.
		2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Thermodynamic parameters are determined without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Document determined thermodynamic parameters	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site and equipment is cleaned and made safe in accordance with established procedures.
	3.3	Thermodynamic parameters are documented including identification of any parameter that is not within the specified range for the system.
	3.4	Work supervisor is notified of the completion of the work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and determining thermodynamic parameters of refrigeration and air conditioning systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ127A Thermodynamic parameters of refrigeration and air conditioning systems

Evidence shall show an understanding of engineering mathematics fundamentals and refrigeration science to an extent indicated by the following aspects:

T1 Arithmetic

- Rational and irrational numbers, surds
- SI units, conversion using unity brackets
- Laws of indices (base 10), scientific and engineering notation
- Estimations, errors and approximations, significant figures

T2 Algebra

- Substitution
- +, -, x on simple polynomials. Simple indices
- Expanding brackets
- Factorising quadratics. Common factors, difference of two squares
- Simplifying algebraic fractions
- Transposition of engineering formulae
- Solving one variable equations
- Simple algebraic division.

T3 Geometry

- Pythagoras Theorem
- Angles: degrees, radians. Parallel lines cut by a transverse
- Triangles: sum of angles, properties of equilateral and isosceles triangles
- Congruent triangles
- Similar triangles: ratio of corresponding sides
- Sin, cos, tan: ratios of a right angled triangle
- Sine and cosine rules
- Circles: circumference, arcs, chords, tangents, circle theorems

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REQUIRED SKILLS AND KNOWLEDGE

- Area and perimeter mensuration on above figures.

T4 Coordinate geometry

- 2D plane; x-y axes, s-t axes
- Graph of linear function, y = ax + b. Functional notation, y = f(x)
- Straight line given slope and one point or given two points
- Linear equations: solving algebraically and geometrically
- Solving 2 linear functions simultaneously, algebraically and geometrically
- Line segment: length and mid point.

T5 Engineering mechanics

- mass/density
- weight
- forces
- specific gravity
- equilibrium
- momentum
- friction loss
- velocity and speed
- energy in all forms
- mechanical advantage
- efficiency
- pressure/stress

T6 Molecular theory

- changes of state
- sublimation
- expansion and contraction
- electron flow
- state of aggregation
- internal potential energy
- phase change diagrams

T7 Thermodynamics

- temperature scales
- conservation of energy
- specific heat
- sensible, latent and super heat
- properties of steam
- enthalpy
- heat energy/temperature relationship
- heat balance on a body

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REQUIRED SKILLS AND KNOWLEDGE

- heat transfer
- conductivity
- calorimetry
- Peltier effect
- 1st and 2nd law of thermodynamics

T8 Gas laws and liquids

- pressure
- Boyles law
- Charles law
- Volumetric relationship
- psychrometrics
- latent heat of vaporisation
- relative humidity
- air conditioning processes
- dynamic pressure loss
- velocity and static pressure
- bourdon tubes
- density and relative density
- Archimedes principle
- Bernoulli’s Equation
- manometers
- absorption refrigeration
- centrifugal compression
- external work of a liquid
- pressure volume diagrams
- isothermal and adiabatic processes
- polytropic processes
- Dalton’s law of partial pressure

T9 Vapour compression

- pressure/enthalpy relationship
- entropy
- characteristics of the evaporation, condensation,
- compression and pressure drop phases
- co-efficient of performance
- theoretical/practical cycles
- characteristics of refrigerants
- theoretical power input
- pressure losses
- heat exchange

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REQUIRED SKILLS AND KNOWLEDGE

- effects of condensing condition changes
- sub-cooling and super-heating

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or

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EVIDENCE GUIDE

less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Determine thermodynamic parameters of refrigeration and air conditioning systems as described in 8) and including:

    A Selecting and using appropriate measuring devices correctly

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EVIDENCE GUIDE

B Interpreting measurements

C Using calculation methods accurately

D Identifying parameters not within the specified range

E Documenting thermodynamic parameters correctly

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in determining thermodynamic parameters of refrigeration and air conditioning systems.

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EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining thermodynamic parameters using measurement and calculation methods of a refrigeration or air conditioning system, including temperature, pressure, relative humidity and enthalpy.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ128A Produce HVAC/R system design drawings

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers interpreting technical data and project specifications and produce HVAC/R system design drawings. It encompasses safe working practices, interpreting technical data and specifications, applying knowledge heating, ventilation, air conditioning and/or refrigeration systems design drawing protocols, using appropriate drawing tools and documenting design.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

OR

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

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Prerequisite Unit(s) **2)**

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite

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Prerequisite Unit(s) **2**)

appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to produce HVAC/R design drawings.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures in preparation for the work are followed

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	The extent of the work is determined from project specifications and discussion with appropriate personnel
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
		1.5	Software tools and equipment a needed for the work are obtained in accordance with established procedures
2	Produce HVAC/R design drawings	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	The types of design drawings and layouts required are determined from project specifications
		2.3	Technical data of system components is interpreted to determine parameters that are to be included in the drawings
		2.4	Appropriate software tools are used to produce drawing based on standard protocols
		2.5	Drawings are checked for accuracy are compliance with project specifications
		2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3	Complete and report HVAC/R design drawings	3.1	Completed drawings are submitted to an appropriate person to be checking for accuracy and compliance with project specifications.
		3.2	Any alterations, additions or correction instructions are followed and drawings are re-submitted for final approval
		3.3	Copies of completed drawings are filed securely in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and producing HVAC/R design drawings.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ128A HVAC/R system drawing

Evidence shall show an understanding of air conditioning drawing, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Standards, regulations and codes

T2 Architectural and mechanical drafting conventions encompassing:

- Fire, hydraulic, electrical layout diagrams,
- Sketching of pipework circuits and mechanical services,
- Drawing standards and symbols,
- Working, detail and assembly drawings,
- Ductwork layouts and conventions,
- Pipework layouts and conventions,

T3 Computer aided drawing techniques

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment,

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such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Produce HVAC/R design drawings as described in 8) and including:

    A Understanding the extent of the drawing work accurately

    B Determining appropriate types of drawings and their layouts correctly

    C Including appropriate technical data parameters in the drawings

    D Checking and correcting drawings accurately

    E Filing copies of completed drawings securely

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in producing HVAC/R design drawings.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to producing design drawings for at least two different HVAC/R projects.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the determination of the heat loads for commercial refrigeration and/or air conditioning applications. It encompasses working safely; determining heat loads using quick selection, short form paper and computer based methods and documenting results.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training or institutional based delivery at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s)

2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of

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Prerequisite Unit(s) **2)**

refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

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Prerequisite Unit(s)	**2**)
	UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring
	UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures
	UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
	UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to determine the heat loads for commercial	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and

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ELEMENT		PERFORMANCE CRITERIA	
	refrigeration and/or air conditioning applications.		procedures are followed in preparation for the work
		1.3	The extent of the heat load analysis is determined from project specifications and discussion with appropriate personnel
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
		1.5	Effective strategies are determined to ensure solution development and implementation is carried out efficiently
2	Determine the heat loads for commercial refrigeration and/or air conditioning applications.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of commercial refrigeration and/or air conditioning system operating parameters is applied when performing heat loads estimation
		2.3	Parameters, specifications and performance requirements in relation to commercial refrigeration and/or air conditioning system are set in accordance with established procedures
		2.4	Approaches to determine the heat loads are carried out to provide most effective solutions
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
		2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3	Complete and report heat loads for commercial refrigeration and /or air conditioning applications.	3.1	Heat load estimations is documented including details of all findings, calculations and assumptions
		3.2	Completed heat loads are submitted to an appropriate person to be checked for accuracy and compliance with project specifications and evaluated to determine whether performance requirements are met

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Heat loads estimation is reported to appropriately personnel to establish appropriate action to be taken based on findings
	3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and determining the heat loads for commercial refrigeration and/or air conditioning applications.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ129A Commercial refrigeration heat load estimating

Evidence shall show an understanding of heat load estimating for commercial refrigeration applications, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Heat transfer

- factors affecting heat transfer
- insulation material characteristics
- vapour barriers (seals)
- ambient conditions
- composite walls (heat flows)
- types of common insulation
- thermal conductivity
- film factors

T2. Cabinet construction and design

- deep freeze case
- meat case
- dairy case
- fruit and vegetable case
- drink cabinets

T3. Air change load

- room volumes
- room usage (average, medium, heavy)
- heat removed from cooling air to refrigerated conditions
- air curtains
- temperature differences
- door opening sizes
- Tamm’s equation

T4. Product load

- sensible heat

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REQUIRED SKILLS AND KNOWLEDGE

- latent heat
- heat of respiration
- storage temperatures
- unit running times
- humidity
- air flows
- stacking of products
- freeze, chill, thaw times

T5. Total freezer/cool room loads

- wall load
- air change load
- product load
- miscellaneous
- total load, safety factor and unit running times
- floor loads in cool rooms
- door opening loads (ASHRAE & RADS methods)
- door opening loads (for trucks)

T6. Process cooling loads

- cooling chemical reactions
- energy balance methods
- sensible & latent cooling of gases
- sensible & latent cooling of water vapour in gas streams

T7. Computer programs

KS02-EJ129A Commercial air conditioning heat load estimating

Evidence shall show an understanding of heat load estimating for commercial air conditioning applications, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Heat flow in buildings

- conduction
- convection
- radiation
- heat paths

T2. Thermal storage

T3. Different methods of calculations

- ASHRAE
- Carrier
- finite difference

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REQUIRED SKILLS AND KNOWLEDGE

T4. U Values.

T5. Film coefficients.

T6. Solar heat

- direct
- diffuse
- sol air temperature
- sun position calculations

T7. Design conditions

- outdoor
- monthly/daily corrections
- comfort/critical
- indoor
- effective temperature

T8. Thermal comfort.

T9. Space characteristics.

T10. Equipment location.

T11. Zoning

T12. Internal loads

- lighting
- equipment
- people
- load profiles
- internal partitions

T13. Fresh air/AS 1668

T14. Calculation of fabric loads

- walls
- roofs
- floors

T15. Windows

- glass types and factors
- shade factors
- internal and external shading
- shading from adjacent structures

T16. Air quantity calculation

- psychrometrics
- by-pass factor

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REQUIRED SKILLS AND KNOWLEDGE

- coil load
- VAV air quantities

T17. Piping and other losses.

T18. Refrigeration plant load.

T19. Computer software

- responsible use

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence

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EVIDENCE GUIDE

need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Determine the heat loads for commercial refrigeration and/or air conditioning applications as described in 8) and including:

A Establishing system parameters for heat load

B Select appropriate head load calculation tools

C Identifying heat loads accurately

D Using calculation methods accurately

E Documenting heat loads correctly

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in determining the heat loads for commercial refrigeration and air conditioning applications.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining heat loads using quick selection short form paper and/or computer based methods for a refrigeration and/or air conditioning system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ130A Produce HVAC/R control system diagrams

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers interpreting technical data and project specifications and produce HVAC/R control system diagrams. It encompasses safe working practices, interpreting technical data and specifications, applying knowledge heating, ventilation, air conditioning and/or refrigeration control systems drawing protocols, using appropriate drawing tools and documenting design.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control

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Prerequisite Unit(s) **2)**

OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to produce HVAC/R control system diagrams	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the work is determined from project specifications and discussion with appropriate personnel.
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
		1.5	Software tools and equipment a needed for the work are obtained in accordance with established procedures

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ELEMENT		PERFORMANCE CRITERIA	
2	Produce HVAC/R control system diagrams	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The types of control diagrams and layouts required are determined from project specifications.
		2.3	Technical data of control system components is interpreted to determine parameters that are to be included in the diagrams
		2.4	Appropriate software tools are used to produce diagrams based on standard protocols.
		2.5	Diagrams are checked for accuracy are compliance with project specifications.
		2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3	Complete and report HVAC/R control system diagrams	3.1	Completed control diagrams are submitted to an appropriate person to be checked for accuracy and compliance with project specifications.
		3.2	Any alterations, additions or correction instructions are followed and diagrams are re-submitted for final approval
		3.3	Copies of completed diagrams are filed securely in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and producing HVAC/R control system design diagrams.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ130A HVAC/R control system fundamentals

Evidence shall show an understanding of HVAC control systems and diagrams, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Control fundamentals

- control terminology
- refrigeration system characteristics
- HVAC system characteristics
- control system characteristics
- control system components
- control system diagrams and symbols
- product knowledge

T2 Types of control equipment

- electrical:
  - classification of circuits
  - two position control
  - floating control
  - sensors
  - controllers
  - flow control devices
  - control systems diagrams
- electronic:
  - operating principles
  - sensors
  - controllers
  - control system diagrams

T3 Control systems applications

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REQUIRED SKILLS AND KNOWLEDGE

- refrigeration
- air conditioning
  - air handling system controls
  - ventilation
  - heating
  - building airflow system control
  - airflow control
  - singles and multi -zones
  - chiller/boiler and distribution system control (chilled water, boiler, distribution systems)

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies

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being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Produce HVAC/R control system design diagrams as described in 8) and including:

    A Understanding the extent of the drawing work accurately

    B Determining appropriate types of diagrams and their layouts correctly

    C Including appropriate technical data parameters in the diagrams

    D Checking and correcting diagrams accurately

    E Filing copies of completed drawing securely

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in producing HVAC/R control system design diagrams.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to producing control system design diagrams for at least two different HVAC/R projects.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ131A Determine noise and vibration encountered in HVAC/R applications

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the measurement of noise and vibration encountered in HVAC/R system. It encompasses working safely, problem solving procedures, including using measuring instruments, applying appropriate theorems and providing interpretations derived from measurements and calculations and justification for such interpretations.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training or institutional based delivery at the aligned AQF 5 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the characteristics and behaviour of material in an engineering environment.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules,

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Prerequisite Unit(s) **2)**

standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to determine noise and vibration encountered in HVAC/R applications	1.1	OH&S procedures for a given work area are obtained and understood
		1.2	OH&S risk control work preparation measures and procedures are followed.
		1.3	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of equipment and products that may be required for the work are established in accordance with established procedures.

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Determine noise and vibration encountered in HVAC/R applications	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure active systems is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Systems are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Established methods are used to determine noise and vibration measurements encountered in HVAC/R application
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Measurements are taken without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices with the minimum waste and rework.
3	Document noise and vibration measurements in HVAC/R applications	3.1	OH&S work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for alternative approach to determine noise and vibration
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and providing measurements to noise and vibration encountered in HVAC/R applications

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ131A Noise and vibration fundamentals

Evidence shall show an understanding of noise and vibration fundamentals, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Fundamentals of sound

- Properties of sound: Wavelength, amplitude, frequency, period, velocity, sound (intensity, pressure, power), decibels
- Sound pressure level
- Sound power level
- Addition of sound levels
- Loudness and weighting networks
- Sound spectrum and octave bands
- Single value representation of sound spectrum
- NR curves
- Sound meters

T2 Fundamentals of vibration

- Terminology: Spring-mass system, spring in series and/or parallel, stiffness, effective stiffness, viscous frictional coefficient, mass, period, frequency (angular, natural, damped, forced), amplitude, static deflection, damping ratio, damping factor, frequency ratio
- SHM (Simple Harmonic Motion)
- Damped vibration
- Forced vibration
- Maximum amplitude and resonance
- Transmissibility and isolation efficiency
- Vibration isolators

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required

9.**2**)

Before the critical aspects of evidence are considered all

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EVIDENCE GUIDE

to demonstrate competency in this unit

prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Determine noise and vibration encountered in HVAC/R applications as described in 8) and including:

A Identifying the dynamic characteristics of systems/materials and the effects due to different operating parameters

B Using established measurement methods

C Taking relevant measurements accurately

D Interpreting measured values appropriately

E Providing correct interpretation of data taken from

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EVIDENCE GUIDE

measurements and calculations

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in providing solutions to vibration problems in HVAC/R system design.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to providing noise and/or vibration measurements in at least two HVAC/R applications.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ132A Design commercial refrigeration systems and select components

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of commercial refrigeration systems. It encompasses applying knowledge of refrigeration and food storage technology, refrigeration system components and piping, safety and regulatory requirements, following design specifications and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training or institutional based delivery at the aligned AQF 5 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications

UEENEEJ165A: Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **2)**

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical

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Prerequisite Unit(s)	**2**)
	equipment for connection to a single phase 230 Volt supply
	UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design commercial refrigeration systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	The extent and nature of the refrigeration system is determined from design specifications.
		1.3	Safety and other regulatory requirements to which the system shall comply are identified, obtained and understood

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Work supervisor or customers are consulted to determine which functions of the system are to be use and the parameter of each and written confirmation sought.
		1.5	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2	Design commercial refrigeration systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of refrigeration and food storage technology, refrigeration system components and piping, performance standards and compliance methods are applied to developing the system design
		2.3	Safety, functional and budgetary considerations are incorporated in the installation design.
		2.4	Equipment required for the system is selected in accordance with the design specifications and established requirements.
		2.5	Location of components of the system is documented to ensure correct operation of system functions.
		2.6	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.7	System design is documented for submission to appropriate person(s) for approval.
		2.8	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for engineering computer applications design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established

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ELEMENT	PERFORMANCE CRITERIA
	organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing commercial refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ132A Commercial refrigeration system design

Evidence shall show an understanding of commercial refrigeration system design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Food spoilage and possible causes

- physical damage
- animal activity
- chemical breakdown
- enzyme activity
- micro-organisms
- effects of temperature change
- effects of humidity change
- effects of freezing on fresh produce
- effects of slow freezing time
- effect of refreezing

T2. Food preservation

- removing or taking out a reactant
- removing or inactivating the catalyst
- reducing temperature
- changing the reaction system
- irradiation

T3. Micro-organisms

- conditions for growth
- potentially hazardous foods
- cross contamination

T4. Identification of food spoilage

- recognition and suggest possible cause

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REQUIRED SKILLS AND KNOWLEDGE

- physical damage
- animal activity
- chemical breakdown
- enzyme activity
- micro - organisms

T5. Types of heat processing techniques

- heat processing using steam and water
- blanching
- pasteurisation
- sterilisation
- evaporation
- heat processing using hot air
- dehydration
- baking and roasting

T6. Types of chilling processing techniques

- chilling and controlled atmosphere storage
- freezing
- freeze drying and freeze concentration
- modified atmosphere combined with low temperature cryovac.

T7. Relevant Standards, Codes, Regulations and industry practices

- Standards and Codes
- Regulations
- Equipment manufactures specifications and practices

KS02-EJ132A Refrigeration system components and piping selection

Evidence shall show an understanding of refrigeration system components and piping

selection, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Relevant Standards, Codes Regulations and industry practices

- AS1677, detailed understanding
- AS 3666, overview
- ozone protection regulations
- IIAR Ammonia Data Book
- ANSI/IIAR standards
- ANSI/ASHRAE Mechanical Refrigeration and IIAR
- bulletins and standards
- Equipment manufactures specifications and practices

T2. Calculation of capacity in heat exchangers

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REQUIRED SKILLS AND KNOWLEDGE

- $Q = UA\ (LMTD)$
- $Q = mc\Delta t$
- $Q = m\ \Delta h$

T3. Evaporators

- commercial types and applications
- coil bypass factor
- effects of evaporator TD on space humidity
- effects of air circulation on product conditions
- selection criteria and selection tables

T4. Condensers

- commercial types and applications
- effects of ambient conditions
- condenser control
- heat rejection factor
- condenser TD
- selection criteria and selection tables

T5. Compressors

- types and applications
- capacity
- displacement
- volume flow rate
- theoretical capacity
- total volumetric efficiency
- effect of operating conditions, including suction
- pressure drop and superheating
- actual capacity
- power
- theoretical requirement
- effects of operating conditions
- actual requirements
- post defrost loads
- pull down torque requirements, high, medium
- and low back pressure compressors
- selection tables, motor selection

T6. Liquid expansion devices

- types, operation and applications
- effects from sub-cooling
- distributor types, operation and applications

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REQUIRED SKILLS AND KNOWLEDGE

- selection tables
- System load balance point encompassing:
- graphical representation
- Line sizing an design
- velocity tables
- pressure drop in lines and fittings
- oil migration stabilisation
- refrigerant velocity
- effect of varying system capacity
- oil traps
- risers
- double risers
- liquid migration
- design for parallel components and multiplex systems

T7. Automatic controls

- fin spacing, suction temp to evaporator suction
- hot-gas bypass valves
- electronic control of valves PLC control
- refrigerant regulating valves
- solenoid valves
- condenser pressure regulating valves
- evaporator pressure regulating valves
- crankcase pressure regulating valves
- cycling controls
- pressure-stats
- thermostats,
- defrost controls
- monitoring and alarm controls
- refrigeration automation systems
- control strategies
- control modes

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement

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EVIDENCE GUIDE

and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria

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EVIDENCE GUIDE

shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design commercial refrigeration systems as described in 8) and including:

A Understanding required operating functions and parameters from the design specification

B Developing the design within the safety, regulatory and functional requirements and budget limitations

C Documenting and presenting design effectively,

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

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EVIDENCE GUIDE

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing commercial refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different commercial refrigeration systems encompassing only one of each major component (i.e. condenser, compressor and evaporator) and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ133A Design industrial refrigeration systems and select components

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of industrial refrigeration systems. It encompasses applying knowledge of refrigeration and food storage technology, industrial refrigeration system components and piping, safety and regulatory requirements, following design specifications and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training or institutional based delivery at the aligned AQF 5 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ132A Design commercial refrigeration systems and select components

UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **2)**

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical

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Prerequisite Unit(s) **2**)

equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design industrial refrigeration systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	The extent and nature of the refrigeration system is determined from design specifications.
		1.3	Safety and other regulatory requirements to which the system shall comply are identified, obtained and understood

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Work supervisor or customers are consulted to determine which functions of the system are to be use and the parameter of each and written confirmation sought.
		1.5	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2	Design industrial refrigeration systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of refrigeration and food storage technology, refrigeration system components and piping, performance standards and compliance methods are applied to developing the system design
		2.3	Safety, functional and budgetary considerations are incorporated in the installation design.
		2.4	Equipment required for the system is selected in accordance with the design specifications and established requirements.
		2.5	Location of components of the system is documented to ensure correct operation of system functions.
		2.6	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.7	System design is documented for submission to appropriate person(s) for approval.
		2.8	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for engineering computer applications design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established

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ELEMENT	PERFORMANCE CRITERIA
	organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing industrial refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ133A Industrial refrigeration systems design and component selection

Evidence shall show an understanding of industrial refrigeration systems design fundamentals, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Relevant Standards, Regulations and industry practices

- AS1677, detailed understanding
- AS 3666, overview
- ozone protection regulations
- IIAR Ammonia Data Book
- ANSI/IIAR standards
- ANSI/ASHRAE Mechanical Refrigeration & IIAR bulletins and standards (list will be provided by Rama)
- Equipment manufactures specifications and practices

T2 Operating characteristics

- pH charts
- refrigerating effect, relate back to air and fluid coolers
- heat of compression, relate back to screw, rotary and reciprocating compressors
- heat rejected high side of the system, relate back to air cooled, evaporative, and water cooled condensers
- variable liquid refrigeration systems & liquid oversee systems
- required mass flow rate of refrigerant and volume flow rate at various points in system
- theoretical compressor power
- required condenser capacity

T3 Major system components

- refrigerants, including R717 and R22
- secondary refrigerants

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REQUIRED SKILLS AND KNOWLEDGE

- component lubricant refrigerant compatibility
- evaporators
- condensers, cooling towers
- compressors
- expansion valves
- interconnecting piping and
- isolating valves
- pilot operated valves
- defrost system components for air, water, recycled water, hot gas, electric methods
- refrigerant accumulators and liquid pumps

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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EVIDENCE GUIDE

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design industrial refrigeration systems as described in 8) and including:

A Understanding required operating functions and parameters from the design specification

B Developing the design within the safety, regulatory and functional requirements and budget limitations

C Documenting and presenting design effectively,

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing industrial refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different commercial refrigeration systems encompassing only one of each major component (i.e. condenser, compressor and evaporator) and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ134A Design heating, ventilation and air conditioning (HVAC) systems and select components

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of heating, ventilation and air conditioning systems and selection of components. It encompasses applying knowledge of commercial air conditioning systems, components and piping, safety and regulatory requirements, following design specifications and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training or institutional based delivery at the aligned AQF 5 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications

UEENEEJ165A: Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **2)**

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical

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Prerequisite Unit(s) **2**)

equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design commercial refrigeration systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	The extent and nature of the refrigeration system is determined from design specifications.
		1.3	Safety and other regulatory requirements to which the system shall comply are identified, obtained and understood

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Work supervisor or customers are consulted to determine which functions of the system are to be use and the parameter of each and written confirmation sought.
		1.5	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2	Design commercial refrigeration systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of refrigeration and food storage technology, refrigeration system components and piping, performance standards and compliance methods are applied to developing the system design
		2.3	Safety, functional and budgetary considerations are incorporated in the installation design.
		2.4	Equipment required for the system is selected in accordance with the design specifications and established requirements.
		2.5	Location of components of the system is documented to ensure correct operation of system functions.
		2.6	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.7	System design is documented for submission to appropriate person(s) for approval.
		2.8	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for engineering computer applications design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established

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ELEMENT	PERFORMANCE CRITERIA
	organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing heating, ventilation and air conditioning (HVAC) systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ134A Commercial HVAC system design

Evidence shall show an understanding of commercial HVAC system design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Design parameters for single-storey buildings (e.g. offices, restaurants, hotels, bars)

- Customer and objective
- Customer concept of environment desired
- Economics
- Client brief

T2. Relevant design criteria

- Building purpose, location, orientation and shape
- External environment ambient conditions
- Internal load diversity
- Thermal capacity behaviour
- Thermal load (full and partial)

T3. Zoning and building usage

- Space and building
- Occupancies, single purpose, multi-purpose

T4. System selection criteria

- Economics
- Environment
- Control requirements
- Existing structures
- New structures
- System components
- Space for equipment and system

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REQUIRED SKILLS AND KNOWLEDGE

- Selection of appropriate system, equipment, ductwork and components

T5. Systems and applications

- Design features, engineering and selection procedures for direct expansion air conditioning systems:
- RAC's, split systems, package units
- Free blow and ducted fan coil units
- Cooling, heat pump and electric heating•

KS02-EJ134A Air conditioning system components and piping selection

Evidence shall show an understanding of air conditioning system components and piping

selection, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Relevant Standards, Codes Regulations and industry practices

- AS1677, detailed understanding
- AS 3666, overview
- ozone protection regulations
- ANSI/IIAR standards
- ANSI/ASHRAE Mechanical Refrigeration and IIAR
- bulletins and standards
- Equipment manufactures specifications and practices

T2. Calculation of capacity in heat exchangers

- $Q = UA\ (LMTD)$
- $Q = mc\Delta t$
- $Q = m\ \Delta h$

T3. Evaporators

- commercial types and applications
- coil bypass factor
- effects of evaporator TD on space humidity
- effects of air circulation on product conditions
- selection criteria and selection tables

T4. Condensers

- commercial types and applications
- effects of ambient conditions
- condenser control
- heat rejection factor
- condenser TD
- selection criteria and selection tables

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REQUIRED SKILLS AND KNOWLEDGE

T5. Compressors

- types and applications
- capacity
- displacement
- volume flow rate
- theoretical capacity
- total volumetric efficiency
- effect of operating conditions, including suction
- pressure drop and superheating
- actual capacity
- power
- theoretical requirement
- effects of operating conditions
- actual requirements
- post defrost loads
- pull down torque requirements, high, medium
- and low back pressure compressors
- selection tables, motor selection

T6. Liquid expansion devices

- types, operation and applications
- effects from sub-cooling
- distributor types, operation and applications
- selection tables
- System load balance point encompassing:
- graphical representation
- Line sizing an design
- velocity tables
- pressure drop in lines and fittings
- oil migration stabilisation
- refrigerant velocity
- effect of varying system capacity
- oil traps
- risers
- double risers
- liquid migration
- design for parallel components and multiplex systems

T7. Automatic controls

- fin spacing, suction temp to evaporator suction
- hot-gas bypass valves

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REQUIRED SKILLS AND KNOWLEDGE

- electronic control of valves PLC control
- refrigerant regulating valves
- solenoid valves
- condenser pressure regulating valves
- evaporator pressure regulating valves
- crankcase pressure regulating valves
- cycling controls
- pressure-stats
- thermostats,
- defrost controls
- monitoring and alarm controls
- refrigeration automation systems
- control strategies
- control modes

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment,

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EVIDENCE GUIDE

the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design heating, ventilation and air conditioning (HVAC) systems as described in 8) and including:

A Understanding required operating functions and parameters from the design specification

B Developing the design within the safety, regulatory and functional requirements and budget limitations

C Documenting and presenting design effectively

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing heating, ventilation and air conditioning (HVAC) systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different heating, ventilation and air conditioning encompassing only one of each major component (i.e. air handling plant, condenser, compressor and evaporator) and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ135A Design control systems for refrigeration or heating, ventilation and air conditioning systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design control systems for a heating, ventilation and air conditioning or refrigeration systems. It encompasses applying knowledge of refrigeration and air conditioning, control systems components, safety and regulatory requirements, following design specifications and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training or institutional based delivery at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ130A Produce HVAC/R control system diagrams

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

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Prerequisite Unit(s) **2)**

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500

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Prerequisite Unit(s) **2)**

Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design control systems for heating, ventilation and , air conditioning or refrigeration systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	The extent and nature of the HVAC or refrigeration system is determined from design specifications.
		1.3	Safety and other regulatory requirements to which the system shall comply are identified, obtained and understood
		1.4	Work supervisor or customers are consulted to determine which functions of the system are to be use

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ELEMENT		PERFORMANCE CRITERIA	
			and the parameter of each and written confirmation sought.
		1.5	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2	Design control systems for heating, ventilation and , air conditioning or refrigeration systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of control systems components, performance standards and compliance methods are applied to developing the system design
		2.3	Safety, functional and budgetary considerations are incorporated into the design.
		2.4	Control equipment required for the system is selected in accordance with the design specifications and established requirements.
		2.5	Location of components of the system is documented to ensure correct operation of system functions.
		2.6	Control system design draft is checked for compliance with the design brief and regulatory requirements.
		2.7	Control system design is documented for submission to appropriate person(s) for approval.
		2.8	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for control systems for heating, ventilation and , air conditioning or refrigeration systems design	3.1	Control system design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established

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ELEMENT	PERFORMANCE CRITERIA
	organizational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing control systems for a heating, ventilation, air conditioning or refrigeration system.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ135A Refrigeration or heating, ventilation and, air conditioning control system design

Evidence shall show an understanding of designing refrigeration/HVAC control systems to meet refrigeration/HVAC system operating requirements through the integration of electrical, electronic, pneumatic and digital controls, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Control systems

- control terminology
- control system characteristics
- control system diagrams and symbols

T2 Types of control equipment

- Electrical (covered in KS01-EJ130A.1)
  - classification of circuits
  - two position control
  - floating control
  - sensors
  - controllers
  - flow control devices
  - control systems diagrams
- Electronic (covered in KS01-EJ130A.1)
  - operating principles
  - sensors
  - controllers
  - control system diagrams
- Pneumatic:
  - Control fundamentals

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REQUIRED SKILLS AND KNOWLEDGE

    - Pneumatic control terminology
    - Definitions
- Control basics
    - Air supply
    - Pilot bleed system
    - Signal amplifier
    - Sensing elements
    - Relays and switches
- Air supply system
    - Air drying methods
    - Pressure regulating valves
    - Pressure reducing valves
- System controllers
    - Thermostats
    - Sensors
    - Actuators
    - Dampers
- System control configuration
    - Sequence control
    - Limit control
    - Changeover control
    - Compensated control
    - Recycling control
    - Pneumatic – electric control
- Control systems

T3 Digital Control Systems

- Computer based control fundamentals
    - Definitions
    - Principles
- Controller configuration
    - Equipment
    - Zone level controllers
    - System level controllers
- Controller software
    - Operating software
    - Application software
- Controller programming
    - System diagrams

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REQUIRED SKILLS AND KNOWLEDGE

- Control diagrams
- Configuration
- Programming
- Initialisation
- EMS, BMS
- SCADA system
- Lan, Bacnet

T4 Applications

- Refrigeration systems
- HVAC systems
  - air handling system controls
  - ventilation
  - heating
  - building airflow system control
  - airflow control
  - single and multi –zones
  - chiller boiler and distribution system
- Logic analysis
- Energy management
- Asset management
- Life cycle
- Supervisory
  - introduction building management
  - remote building control interface and modem

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment,

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EVIDENCE GUIDE

such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design control systems for a heating, ventilation, air conditioning or refrigeration system as described in 8) and including:

A Understanding required operating functions and parameters from the design specification

B Developing the design within the safety, regulatory and functional requirements and budget limitations

C Documenting and presenting design effectively

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing control systems for a heating, ventilation, air conditioning or refrigeration system.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing a control system for at least two different heating, ventilation, air conditioning or refrigeration systems encompassing only one of each major component (i.e. condenser, compressor and evaporator) and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ136A Evaluate and report on building services energy management systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers evaluation of energy management building services plant and machinery. It encompasses working safely, setting up and conducting evaluation measurements, evaluating energy use from measured parameters and reporting results including recommending any resulting corrective actions.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of refrigeration or air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits

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Prerequisite Unit(s) **2)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems

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Prerequisite Unit(s) **2)**

UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to evaluate and report on energy management.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of evaluation is determined from specifications of building services plant and machinery and discussion with appropriate personnel.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2	Evaluate energy management.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	In-depth knowledge of the energy management of building services plant and machinery is applied to the evaluation process
		2.4	Energy evaluation tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
		2.5	Energy evaluation tests are carried out methodically and results and comments systematically noted.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Evaluation is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT		PERFORMANCE CRITERIA	
3	Report on energy management	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Results of energy management evaluation are documented including recommendations and justification for improvements.
		3.4	Energy evaluation report is forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and evaluating and reporting on energy management.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ136A Energy management fundamentals

Evidence shall show an understanding of energy management fundamentals, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Typical energy sources and characteristics

- supply authorities
- standard units of measurement
- electricity
- steam
- hot water
- high temperature hot water
- town gas
- LP Gas
- solar
- waste heat
- petrol
- diesel

T2 Energy Usage

- office lighting
- air conditioning systems
- refrigeration systems
- security systems
- computer systems
- standby/emergency systems
- lifts and escalators

T3 Energy auditing process

- energy costs and tariffs

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REQUIRED SKILLS AND KNOWLEDGE

- energy consumption
- predicting future costs
- plotting consumption trends
- historical data
- collecting information using surveys
- comparisons of actual to recorded usage
- energy balance
- instrumentation
- building management systems
- estimating savings potential

T4 System operation for energy efficiency

- types of systems
- efficiency in building structures
- operation of a vehicle fleet
- proportion total energy consumption against individual systems
- passive building design
- preventative maintenance procedures
- monitoring building management systems
- operation of major and minor plant
- inappropriate energy management procedures
- building plant control systems
- Australian standards/local authority requirements
- case studies

T5 Implementing energy management procedures for a building

- recording base year data
- climatic conditions for locality
- establishing energy costs and tariffs
- building and systems surveys
- payback period
- survey analysis
- energy conservation procedures
- informing stockholders
- recommendations and documentation
- implementation issues
- monitoring, evaluation and follow up

KS02-EJ136A Building management systems

Evidence shall show an understanding of building management systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 Functions of a BMS

- autonomous Functions
- input
- output
- general I/O
- installation management items
- energy management
- risk management
- information processing
- objectives
- building running costs
- smoke control as per AS 1668 part 1

T2 BMS hardware

- system architecture
- communication devices
- substations
- PC’s
- interfaces with other systems

T3 Input and output functions

- digital inputs/outputs
- digital output with status feedback
- analogue input/output
- sensors
- alarms

T4 Energy management

- night cycle
- optimum stop/start
- time and event programs
- night purge
- outside air percentage control
- enthalpy control
- power demand control
- duty cycle
- presence detection
- lighting control

T5 Information processing functions

- computer systems
- central system management

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REQUIRED SKILLS AND KNOWLEDGE

- programs
- system configuration and security
- operator - machine interface
- data points

T6 Risk and maintenance management

- system files
- fire, intruder control
- access control

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

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EVIDENCE GUIDE

equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Evaluate and report on energy management as described in 8) and including:

A Determining the extent of the evaluation.

B Setting up and conducting appropriate examinations and tests.

C Reporting evaluation including recommendation for improving energy efficiency

D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in evaluating and reporting on energy management.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to at least two different types of building services plant and machinery.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ137A Evaluate and report on the indoor air quality of buildings

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers evaluation of air quality in a building. It encompasses working safely, setting up and conducting evaluation measurements, evaluating air quality from measured parameters and reporting results including recommending any resulting corrective actions.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of refrigeration or air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits

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Prerequisite Unit(s) **2)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems

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Prerequisite Unit(s) **2)**

UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to evaluate and report on air quality in buildings.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of evaluation is determined from specifications of building ventilation/air conditioning and internal and external environmental factors and discussion with appropriate personnel.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2	Evaluate air quality in buildings.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	In-depth knowledge of the air quality requirements and regulations in buildings is applied to the evaluation process.
		2.4	Air quality evaluation tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
		2.5	Air quality evaluation tests are carried out methodically and results and comments systematically noted.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Evaluation is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Report on air quality buildings.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Results of air quality evaluation are documented including unacceptable conditions and recommendation for improvement.
	3.4	Energy evaluation report is forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and evaluating and reporting on air quality in buildings.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ137A Indoor air quality

Evidence shall show an understanding of evaluating and reporting of a building's indoor air quality, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Indoor air quality factors

- interactive nature of pollutants
- comfort criteria
- source of odours
- pathway form source to occupants
- occupant activities
- impact on productivity

T2 Causes of IAQ problems

- moisture
- mould and mildew
- bacterial growths
- asbestos and other particulate
- volatile chemicals produced in the building
- chemical products

T3 HVAC systems

- types of HVAC systems
- system components
- duct cleaning
- system commissioning
- operation of system
- damper adjustment

T4 Measurements

- common parameters to measure

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REQUIRED SKILLS AND KNOWLEDGE

- measurement devices available
- instrument calibration
- analysing and interpreting results
- laboratory tests
- standards
- evaluation and reporting of IAQ

T5 Resolving IAQ problems

- conducting IAQ investigations
- the walk-through
- building history
- HVAC system information
- occupant interviews
- troubleshooting

T6 IAQ management

- building IAQ profile
- location of potential IAQ problems
- procedures to control IAQ
- communication
- response to complaints
- equipment preventive maintenance
- chemical inventory

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for

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EVIDENCE GUIDE

apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Evaluate and report on air quality in buildings as described in 8) and including:

    A Determining the extent of the evaluation.

    B Setting up and conducting appropriate examinations and tests.

    C Reporting evaluation including recommendation for improving energy efficiency

    D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in evaluating and reporting on air quality in buildings.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to evaluating and reporting at least two different types of buildings with or without air conditioning.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ138A Analyse vibration and noise in refrigeration and air conditioning systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the analysis of refrigeration and air conditioning systems to provide solutions to noise and vibration issues. It encompasses working safely, apply extensive knowledge of noise and vibration parameters, gathering and analysing data, applying problem solving techniques, developing and documenting results and solutions for use in design work.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ165A: Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology

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Prerequisite Unit(s)

2)

equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to

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Prerequisite Unit(s)	**2**)
	electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to analyse noise and vibration in refrigeration and air conditioning systems	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the noise and vibration issue is determined from performance specifications and situation reports and in consultations with relevant persons.

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
		1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2	Analyse noise and vibration in refrigeration and air conditioning systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of noise, vibration and thermodynamics are applied to analytical solutions to refrigeration and air conditioning systems.
		2.3	Parameters, specifications and performance requirements in relation to refrigeration and air conditioning systems are obtained in accordance with established procedures.
		2.4	Approaches to analysing noise and vibration parameters are carried out to provide the most effective solution.
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
		2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3	Document and report on the results of the noise and vibration analysis and actions taken.	3.1	Solutions to noise and vibration issues are evaluated to determine their effectiveness and modified where necessary.
		3.2	Analysis is documented including details of all findings, calculations and assumptions.
		3.3	Analysis is reported to appropriately personnel to establish appropriate action to be taken based on findings.
		3.4	Justification for findings and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and analysing noise and vibration in refrigeration and air conditioning systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ138A Noise and vibration in refrigeration and air conditioning systems

Evidence shall show an understanding of noise and vibration in refrigeration and air conditioning systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Fundamentals of sound

- frequency
- decibels
- octave bands
- direct sound
- velocity
- sound pressure level
- sound power level
- sound meters

T2 Noise and people

- physical measurement of sound
- weighting networks
- NR curves
- noise damage to hearing
- evaluate daily noise exposures
- peak noise levels
- attenuation for hearing protectors
- excess noise levels permissible
- noise abatement acts
- advanced noise and vibration control

T3 Sound in confined and unconfined spaces

- Inverse square laws
- Direct and reflective sound

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REQUIRED SKILLS AND KNOWLEDGE

- Define reverberation time
- Sabine's formula
- Absorption coefficients of surfaces
- Types of absorbers and their operation
- Insulation performances of partitions

T4 Identify and analyse problems

- one-dimensional sound waves
- standing waves
- energy in a sound wave
- sources
- effects of air turbulence
- transmitters
- amplifiers
- absorptivity
- reflectivity
- room characteristics
- acoustic design in buildings
- fan and air noise transmission in ducts

T5 Methods of control

- natural attenuation
- sound absorbing materials, placement
- duct lining
- lined plenums
- lined duct splitters
- duct attenuators
- white noise
- vibration isolators

T6 Acoustic specifications

- attenuator ratings

T7 Sound insulation

- Plant room breakout
- Controlling plant room noise

T8 Duct borne noise

- Sound power spectra for fans
- Noise attenuation in ducts and fittings
- Reducing fan noise transmission
- Regeneration noise
- Sources of regenerated noise

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REQUIRED SKILLS AND KNOWLEDGE

- Use tables to estimate regenerative noises
- Breakout situations
- Fan noise breakout
- List methods of controlling breakout

T9 Controlling the cost

- Economical use of attenuation

T10 Vibration

- SHM (Simple Harmonic Motion)
- Period
- Frequency
- Amplitude
- Estimate frequencies for fans, pumps and refrigeration plant
- Estimate transmission of vibration
- Vibration control for building structures
- Use transmissibility graphs to select springs, vibration eliminators and pads
- Types of isolation materials and mounting devices
- Select isolation and mounting devices
- Inertia blocks

T11 Relevant standards, regulation and codes

T12 Noise and vibration analysis computer software packages

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred

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EVIDENCE GUIDE

model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse noise and vibration in refrigeration and air conditioning systems as described in 8) and including:

A Understanding the noise and vibration issues

B Forming effective strategies for analysing refrigeration and air conditioning systems performance

C Obtaining noise and vibration parameters, specifications and performance requirements appropriate to each situation.

D Evaluating the results of the analysis

E Documenting analysis details of all findings, calculations and assumptions.

F Documenting justification of actions to be implemented in accordance with professional standards

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used

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EVIDENCE GUIDE

to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in analysing noise and vibration in refrigeration and air conditioning systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to analysing noise and vibration in at least two different refrigeration and air conditioning systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ139A Develop specifications and prepare drawings for HVAC/Refrigeration projects

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers specification development and documentation of HVAC/Refrigeration projects. It encompasses safe working practices, following a design brief, applying knowledge heating, ventilation, air conditioning and/or refrigeration systems to selecting system components, operating within established project budget and developing project specifications and design drawings.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ128A Produce HVAC/R system design drawings

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology

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Prerequisite Unit(s) **2)**

equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to

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Prerequisite Unit(s)	**2**)
	electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop specifications and prepare drawings	1.1	OHS processes and procedures for a given work area are identified, identified, obtained and understood
		1.2	The extent of the project is established from design brief and/or other relevant documentation and from discussions with appropriate person(s).
		1.3	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved in the work
		1.4	Software tools and equipment a needed for the work are obtained in accordance with established procedures

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ELEMENT		PERFORMANCE CRITERIA	
2	Develop specifications and prepare drawings	2.1	Sources of components and materials needed for the project are established and selected for their availability, suitability for purpose and cost in accordance with organisation policies and procedures.
		2.2	Specifications are developed that include the necessary performance requirements for components and system.
		2.3	Risk management strategies for the project are sought and obtained for incorporating in the specification.
		2.4	Appropriate software tools are used to develop specifications and produce drawing based on standard protocols.
		2.5	Project specifications and drawings are reviewed against all inputs and adjusted to rectify any anomalies.
		2.6	Project specifications and drawings are documented in accordance with organisation policies and procedures.
		2.7	Solutions to unplanned situation are provided consistent with organisation's policy.
		2.8	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3	Obtain approval for specifications and drawings.	3.1	Project specifications and drawings are presented and discussed with person(s) of higher authority.
		3.2	Alterations to the project specifications and drawings resulting from the presentation / discussion are negotiated with person(s) of higher authority within the constraints of organisation's policy.
		3.3	Final project specifications and drawings are documented and approval obtained from appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing specifications and preparing drawings for HVAC/R projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ139A Specification development

Evidence shall show an understanding of specification writing, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Purpose and nature of specification

T2 Performance based specifications

T3 Prescriptive specifications

T4 Acceptable evidence of compliance

T5 Additional service required with the supply of equipment

T6 Dealing with suppliers and manufacturer's

T7 Documenting specification.

KS02-EJ139A Computer aided drafting

Evidence shall show an understanding of computer aided drafting, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Specific procedures

- Creating symbols for library files
- Program specific commands
  - Speed enhancement
- Configuring the digitising tablet

T2 Methodology for creating layers

- Name
- Colour
- Linetype

T3 Methodology for drawing variables

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REQUIRED SKILLS AND KNOWLEDGE

- Limits
- Grid
- Snap
- Dimensions
- Text
- Units

T4 ISO drawing sheets

T5 Advanced drawings

T6 Multiple three dimensional views

- Setting up environment on screen
- Top view
- Front and side views
- Three dimensional views

T7 Movement through space

- Draw on any created views
- Relocate coordinate system as necessary

T8 Creation of views

- Creation of three dimensional geometric shapes
- Creation of three dimensional complex view by:
- Manipulation of drawing planes
- Location of geometric shapes

T9 Editing

- Use of function to facilitate modification of geometric shapes in completion of a three dimensional view

T10 Display of three dimensional view

- Wire Line
- Solid Face
- Isometric
- Perspective
- Orthographic

T11 Saving

- Use of assembly drawing file for plotting

Evidence Guide

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

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EVIDENCE GUIDE

competency in this unit

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop specifications and prepare drawings for HVAC/R projects as described in 8) and including:

A Determining the project requirements accurately

B Establishing source and availability of components appropriately

C Including the performance requirements of components and the system and risk management strategies in the specifications

D Negotiating alterations to the project specifications and drawings successfully

E Documenting project specifications and drawings in

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accordance with organisation policies and procedures

F Obtaining approval for the completed project specifications and drawings

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in developing specifications and preparing drawings for HVAC/R projects.

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Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to developing specifications and preparing drawings for at least two different HVAC/R projects for at least two different HVAC/R projects.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ141A Design complex commercial refrigeration systems and select equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers the design of complex commercial refrigeration systems. It encompasses applying knowledge of complex commercial refrigeration systems, safety and regulatory requirements, developing alternative design schemes based on a design brief and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.3. Prerequisites.

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Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ132A Design commercial refrigeration systems and select components

UEENEEJ138A Analyse vibration and noise in refrigeration and air conditioning systems

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications

UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules,

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standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design complex commercial refrigeration system	1.1	OHS processes and procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the proposed refrigeration system is determined from the design brief or in consultations with appropriate person(s).

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2	Design complex commercial refrigeration system	2.1	Knowledge of commercial refrigeration processes and methods are applied to the design.
		2.2	Alternative concepts for the design are evaluated based on the requirements outlined in the design brief. (See Note)
		2.3	Safety, functional and budget considerations are incorporated in the design.
		2.4	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.5	System design is documented for submission to appropriate person(s) for approval.
		2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for complex commercial refrigeration system design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

Note.
Design concepts should be evaluated by real or virtual prototyping where it cannot be shown easily by other means that particular aspects of the design met specified requirements.

Required Skills and Knowledge

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REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing a complex commercial refrigeration system.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ141A Complex commercial refrigeration system design

Evidence shall show an understanding of complex commercial refrigeration system design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Commercial refrigeration system types

- medium and low temperature applications
- operating conditions
- system operating and service requirements
- refrigerant types
- components
- multiple evaporator systems
- multiple temperature systems
- multiple compressor (rack) systems
- two stage compressors
- multiplex systems
- defrost requirements and methods
- electric defrost systems
- hot gas defrost systems
- cool gas defrost systems

T2 Manufacturer's data

- rating tables
- selection tables
- catalogues.

T3 Operating characteristics

- Effects of temperature glide with blended refrigerants,
- Ph Charts,
- Refrigerating Effect,
- Heat of compression,
- Heat Rejected on High Side of the System,
- required mass flow rate of refrigerant,
- Volume flow rate at various points in system,

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REQUIRED SKILLS AND KNOWLEDGE

- Theoretical compressor power,
- required condenser capacity.

T4 Review refrigerant flow controls

- refrigerant regulating valves
- solenoid valves
- expansion valves
- pressure regulating valves

T5 Review automatic systems controls

- cycling controls
- pressure-stats
- thermo-stats
- defrost controls
- monitoring and alarm controls
- energy management systems
- refrigeration automation system
- control strategies
- control modes

T6 System design

- Required cooling capacity per day
- Running time and required system cooling capacity
- System capacity control for peak and low load
- Refrigeration system diagrams
- Refrigerant, equipment, major component, controls, piping and accessory selection

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably

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EVIDENCE GUIDE

gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design a complex commercial refrigeration system as described in 8) and including:

A Developing outlines of alternative designs

B Developing the design within the safety, regulatory, functional requirements and budget limitations

C Documenting and presenting design effectively

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing a complex commercial refrigeration system.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ040B	Manage refrigeration and air conditioning projects

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing a complex commercial refrigeration system incorporating multiple major components (i.e. compressors, condenser or evaporators) circuits or systems and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ142A Design complex industrial refrigeration systems and select equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of complex industrial refrigeration systems. It encompasses applying knowledge of industrial refrigeration systems, safety and regulatory requirements, developing alternative design schemes based on a design brief and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ133A Design industrial refrigeration systems and select components

UEENEEJ138A Analyse vibration and noise in refrigeration and air conditioning systems

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications

UEENEEJ132A Design commercial refrigeration systems and select components

UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

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Prerequisite Unit(s)	**2)**
	or
	UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations
	UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace
	UEENEEE102A Fabricate, assemble and dismantle utilities industry components
	UEENEEE003B Solve problems in extra-low voltage single path circuits
	UEENEEE105A Fix and secure electrotechnology equipment
	UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications
	UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work
	UEENEEJ102A Prepare and connect refrigerant tubing and fittings
	UEENEEJ103A Establish the basic operating conditions of vapour compression systems
	UEENEEJ104A Establish the basic operating conditions of air conditioning systems
	UEENEEJ106A Install refrigerant pipe work, flow controls and accessories
	UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment
	UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants
	UEENEEJ110A Select refrigerant piping, accessories and associated controls
	UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components
	UEENEEJ113A Commission air conditioning and refrigeration systems
	UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
	UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

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Prerequisite Unit(s)

2)

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills

3)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design complex commercial refrigeration system	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the proposed refrigeration system is determined from the design brief or in consultations with appropriate person(s).
		1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2	Design complex commercial refrigeration system	2.1	Knowledge of industrial refrigeration system, processes and methods are applied to the design.
		2.2	Alternative concepts for the design are evaluated based on the requirements outlined in the design brief. (See Note)
		2.3	Safety, functional and budget considerations are incorporated in the design.
		2.4	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.5	System design is documented for submission to appropriate person(s) for approval.
		2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for complex commercial refrigeration system design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established

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ELEMENT	PERFORMANCE CRITERIA
	organizational or professional standards.

Note.
Design concepts should be evaluated by real or virtual prototyping where it cannot be shown easily by other means that particular aspects of the design met specified requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing complex industrial refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ142A Complex industrial refrigeration system design

Evidence shall show an understanding of complex industrial refrigeration system design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Standards

- AS1677
- ANSI/IIAR Standards
- ANSI/ASHRAE Standards
- IIAR Bulletins

T2 Moderate and low temperature industrial refrigeration systems

- revise direct, flooded and pumped liquid recirculation systems
- evaporators
- multi-staged compression
- direct staging
- cascade staging
- compound compressors
- de-superheaters, liquid injection
- direct expansion intercoolers
- open and closed intercoolers
- basic designs of accumulators/intercooler vessels

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REQUIRED SKILLS AND KNOWLEDGE

- oil cooling methods
- oil stabilisation, return and oil recovery in flooded systems

T3 Multiple evaporators and multiple compressors

- parallel evaporators
- multiple temperature systems
- evaporator pressure regulators
- temperature control methods
- parallel compressors
- pipework layout
- methods of establishing pressure drop in dry and wet suction lines

T4 Indirect refrigeration systems

- classification according to AS1677
- applications
- evaporators
- heat exchangers, types, construction, selection
- secondary refrigerants
- brines
- antifreeze solutions

T5 Flooded systems

- applications
- equipment
- accumulators
- level controls
- liquid recirculation pumps
- liquid pressure relief valve

T6 Cryogenic systems

- applications and equipment
- system components
- refrigerants
- design safety
- economics
- cascade systems

T7 Basic control sequences

- maintaining evaporator conditions
- staging and suction pressure control
- maintaining condenser conditions
- control of intermediate pressure, methods of industrial refrigeration compressor capacity control

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REQUIRED SKILLS AND KNOWLEDGE

T8 System design

- Required cooling capacity per day
- Running time and required system cooling capacity
- System capacity control for peak and low load
- Refrigeration system diagrams
- Refrigerant, equipment, major component, controls, piping and accessory selection

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence

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EVIDENCE GUIDE

need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design complex industrial refrigeration systems as described in 8) and including:

A Developing outlines of alternative designs

B Developing the design within the safety, regulatory, functional requirements and budget limitations

C Documenting and presenting design effectively

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing complex industrial refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing a complex industrial refrigeration system incorporating multiple major components (i.e. compressors, condenser or evaporators) circuits or systems and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ143A Design complex air conditioning systems and select equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of complex air conditioning systems. It encompasses applying knowledge of complex air conditioning systems, safety and regulatory requirements, developing alternative design schemes based on a design brief and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ134A Design heating, ventilation and air conditioning (HVAC) systems and select components

UEENEEJ138A Analyse vibration and noise in refrigeration and air conditioning systems

UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle

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Prerequisite Unit(s) **2)**

utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

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Prerequisite Unit(s) **2)**

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design complex commercial refrigeration system	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the proposed refrigeration system is determined from the design brief or in consultations with appropriate person(s).

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2	Design complex commercial refrigeration system	2.1	Knowledge of complex air conditioning processes and methods are applied to the design.
		2.2	Alternative concepts for the design are evaluated based on the requirements outlined in the design brief. (See Note)
		2.3	Safety, functional and budget considerations are incorporated in the design.
		2.4	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.5	System design is documented for submission to appropriate person(s) for approval.
		2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for complex commercial refrigeration system design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

Note.
Design concepts should be evaluated by real or virtual prototyping where it cannot be shown easily by other means that particular aspects of the design met specified requirements.

Required Skills and Knowledge

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REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing complex air conditioning systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ143A Complex HVAC system design

Evidence shall show an understanding of complex air conditioning system design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 HVAC load estimating of multiple zone and multi-storey buildings

- System design parameters
  - human comfort
  - system requirements in accordance with AS1668
  - heat transfer calculations for complex structures and building components
  - heat and radiation transfer calculations through complex glass structures including various internal and external shading devices
  - indoor air quality
  - olfs and decipols
- Complex shading
  - solar data, azimuth and altitude angles
  - shading from adjacent structures
- Computer software
  - heat load estimating
  - building thermal performance analysis and simulation software

T2 Advanced Psychrometrics

- Complex psychrometric processes
  - revise sensible cooling and heating and evaporative (adiabatic) cooling
  - cooling and dehumidification
  - cooling and dehumidification with high latent load
  - cooling and dehumidification all out door air
  - cooling and dehumidification all out door air with dehumidified air requirements less than supply air
  - cooling with evaporative humidification
  - cooling with near isothermal humidification
  - spray process to include cooling and dehumidification, cooling and humidification with heated spray water, heating and humidification.
  - partial load processes

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REQUIRED SKILLS AND KNOWLEDGE

  - reheat
  - bypass of, RA only and mix of RA & OA
  - variable air volume
  - variable coil effective surface temperature
  - split coil, horizontal, vertical and intertwined.
- System performance
  - saturation efficiency of sprayers
  - system capacity calculated from air quantity and enthalpy change
- Required plant capacity and airflow rates
  - effects of coil bypass factor and ADP
  - calculation of dehumidified air quantity, using both TSH and ERSH methods.
- Recap on psychrometrics formulae and charts
  - properties of air
  - gas constants
  - derivation of air constants
  - combined gas laws
  - Dalton’s law of partial pressures
  - Carrier’s equation
  - psychrometric property tables
  - psychrometric charts
  - air mixing equations
  - air quantity equations
  - indirect evaporative coolers
  - analysis of cooling coil selection and performance
  - psychrometric analysis of:
  - air conditioning in tropics
  - all outdoor air
  - LCV/HWF systems
  - psychrometric analysis using equations and tables

T3 Air conditioning system design

- Design parameters for multi-storey building
  - customer and objective
  - customer concept of environment desired
  - economic
  - client brief
- Relevant design criteria
  - building purpose, location, orientation and shape
  - external environment ambient conditions

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REQUIRED SKILLS AND KNOWLEDGE

  - internal load diversity
  - thermal capacity behaviour
  - thermal load (full and partial)
- Zoning and building usage
  - space and building
  - occupancies, single purpose, multi-purpose
- System selection criteria
  - economics
  - environment
  - control requirements
  - existing structures
  - new structures
  - system components
  - space for equipment and system
  - selection of appropriate system
- System and applications
  - design features, engineering procedures and controls for:
  - direct expansion - self contained room/zone, heat pump, multi-zone fan-coils, central station
  - all water - room fan-coil
  - all-air - constant volume variable temperature, face and bypass, reheat, constant temp variable volume, constant volume induction, dual-duct, dual-conduit
  - air water - induction unit, primary air fan- coil
- HVAC energy conversation techniques
  - heat recovery systems
  - night cycle
  - optimum stop/start
  - purge cycles
  - chiller/boiler/cooling tower sequencing
  - economy cycles (based on temperature or enthalpy)
  - supply air reset
  - supply water reset
  - condenser water temperature reset
  - power demand control
  - load limiting
  - load shedding
  - set point relaxation
  - ventilation cycles

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REQUIRED SKILLS AND KNOWLEDGE

- plant - fixed OA to economy, boiler to electric reheat, constant volume to VAV etc.
- cost-benefit (payback)

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational

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EVIDENCE GUIDE

requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design complex air conditioning systems as described in 8) and including:

    A Developing outlines of alternative designs

    B Developing the design within the safety, regulatory, functional requirements and budget limitations

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EVIDENCE GUIDE

C Documenting and presenting design effectively

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing complex air conditioning systems.

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EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing a complex air conditioning system incorporating multiple major components (i.e. air handling plant, compressors, condenser or evaporators) circuits or systems and associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ144A Design mechanical ventilation/exhaust systems and select equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of mechanical ventilation/exhaust systems. It encompasses applying knowledge mechanical ventilation/exhaust systems, safety and regulatory requirements, developing alternative design schemes based on a design brief and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ134A Design heating, ventilation and air conditioning (HVAC) systems and select components

UEENEEJ138A Analyse vibration and noise in refrigeration and air conditioning systems

UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle

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Prerequisite Unit(s) **2)**

utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

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Prerequisite Unit(s) **2)**

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design mechanical ventilation/exhaust systems and select equipment	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the proposed mechanical ventilation/exhaust system is determined from the design brief or in consultations with appropriate

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ELEMENT		PERFORMANCE CRITERIA	
			person(s).
		1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2	Design mechanical ventilation/exhaust systems and select equipment	2.1	Knowledge of mechanical ventilation/exhaust processes and methods are applied to the design.
		2.2	Alternative concepts for the design are evaluated based on the requirements outlined in the design brief. (See Note)
		2.3	Safety, functional and budget considerations are incorporated in the design.
		2.4	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.5	System design is documented for submission to appropriate person(s) for approval.
		2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for mechanical ventilation/exhaust systems design and equipment selection	3.1	System design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

Note.
Design concepts should be evaluated by real or virtual prototyping where it cannot be shown easily by other means that particular aspects of the design met specified requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing mechanical ventilation/exhaust systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ144A Exhaust systems design

Evidence shall show an understanding of exhaust systems design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Relevant codes and regulations

- health and safety
- noise
- smoke
- fire
- hazard identification

T2 System types

- applications
- application flow charts
- system requirements
- hazard identification
- effluent types and removal
- relationship with smoke spill systems
- supply air dilution applications
- natural ventilation applications
- fan assisted exhaust applications
- replenishment of exhaust air
- system components

T3 Duct design

- static, velocity, total pressure
- pressure drop
- fouling
- transitions
- elbows
- fan position and mounting
- noise and noise attenuation
- requirements for access and maintenance

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REQUIRED SKILLS AND KNOWLEDGE

- system integrity

T4 Fan and motor selection

- applications
- suitable fan types
- motor rating and suitability
- balancing the fan duct system
- flame proofing

T5 Filters and filter selection

- types and applications
- capture velocity

T6 Outlet design and location

- prevailing winds
- position relative to air intakes
- weather and bird proofing

T7 Cycling/operation control

- applications
- code/regulation requirements
- monitoring of contaminants
- contaminant detection

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to

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EVIDENCE GUIDE

include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design mechanical ventilation/exhaust systems as described in 8) and including:

    A Developing outlines of alternative designs

    B Developing the design within the safety, regulatory, functional requirements and budget limitations

    C Documenting and presenting design effectively

    D Successfully negotiating design alteration requests

    E Obtaining approval for final design

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing mechanical ventilation/exhaust systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different mechanical ventilation and exhaust systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ145A Design hydronic systems and select equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of hydronic systems. It encompasses applying knowledge of hydronic systems, safety and regulatory requirements, developing alternative design schemes based on a design brief and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ138A Analyse vibration and noise in refrigeration and air conditioning systems

UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

Or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage

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Prerequisite Unit(s) **2)**

single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt

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Prerequisite Unit(s) **2)**

supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design hydronic systems and select equipment	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the proposed hydronic system is determined from the design brief or in consultations with appropriate person(s).
		1.4	Design development work is planned to meet

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ELEMENT		PERFORMANCE CRITERIA	
			scheduled timelines in consultation with others involved on the work site.
2	Design hydronic systems and select equipment	2.1	Knowledge of hydronic systems, processes and methods are applied to the design.
		2.2	Alternative concepts for the design are evaluated based on the requirements outlined in the design brief. (See Note)
		2.3	Safety, functional and budget considerations are incorporated in the design.
		2.4	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.5	System design is documented for submission to appropriate person(s) for approval.
		2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for hydronic system design and equipment selection	3.1	System design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

Note.
Design concepts should be evaluated by real or virtual prototyping where it cannot be shown easily by other means that particular aspects of the design met specified requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing hydronic systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ145A HVAC/R hydronic system design

Evidence shall show an understanding of HVAC/R hydronic system design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Hydronic system design fundamentals

- Principles of fluid flow
  - properties of fluids
  - flow of ideal fluids
  - fluid flow equipment
  - Bernoulli Theorem
  - fluid flow in pipes
- Pressure loss and static head - calculation
  - flow throughout system
  - pressure throughout system
  - friction losses
  - pressure loss charts for: copper, steel, UPVC
  - dynamic losses
  - fitting pressure losses
  - fitting interaction
  - total losses
  - calculating system (static and dynamic) head
- Pump performance and selection
  - pump classification and types
  - pump performance terminology, discharge, head, power, efficiency, speed, net positive suction head required
  - pump performance curves
  - pump laws
  - system head and ‘K’ factor
  - balance points
  - energy considerations
  - pump cavitation

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REQUIRED SKILLS AND KNOWLEDGE

- calculation of net positive suction head available
- Series and parallel operation

- Pipe sizing
  - maximum friction rate
  - erosion and equipment life
  - industry standards
  - recommended system water velocities
  - economic balance - first cost and operating cost

T2 Hot water systems

- boilers
- coils
- expansion tanks
- pumps, characteristics curves
- control valves, types, flow diagrams,
- air purge points
- water treatment
- pipe anchors and expansion joints

T3 Chilled water systems

- Chillers
- Coils
- expansion tanks
- pumps, characteristics curves
- control valves, types, flow diagrams,
- air purge points
- water treatment
- pipe anchors and expansion joints

T4 HVAC/R hydronic systems

- Systems operation
  - closed/open systems
  - pump head/lift, static head (high rise building)
  - system friction losses
  - nett positive suction head
  - system curves
- Pumps
  - types
  - selection criteria
  - performance characteristics
  - bladder tanks

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REQUIRED SKILLS AND KNOWLEDGE

- coil characteristics
- heat exchangers: plate, shell and tube, tube in tube
- flow measurements: types
- flow switchers
- builders: types and performance characteristics
- cooling towers: elementary cooling thermodynamics and types

- Valves - flow control devices
  - types and applications
  - throttling characteristics
  - flow measurements
  - selection and applications
- Hydronic system configuration and design
  - piping configurations
    - single pipe closed circuit
    - two pipe closed circuit
    - direct return
    - three pipe closed circuit with reversed return
    - three way diverting valves
    - risers and headers
    - component location
  - evaluation of piping configurations
    - capital cost
    - owning and operating costs
    - noise vibration
    - maintenance
    - future expansion
    - commissioning and balancing
  - operating characteristics
    - cavitation
- System pipe sizes
  - pipe dynamic and friction losses for different materials
  - fitting pressure losses for different materials
  - thermal heat losses
  - bare, insulated and underground pipes

Evidence Guide

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

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competency in this unit

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design hydronic systems as described in 8) and including:

A Developing outlines of alternative designs

B Developing the design within the safety, regulatory, functional requirements and budget limitations

C Documenting and presenting design effectively

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions

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incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing hydronic systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different hydronic systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ146A Design complex control systems for refrigeration or heating, ventilation, air conditioning systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of complex control systems for heating, ventilation, air conditioning or refrigeration system. It encompasses applying knowledge of complex control systems for a heating, ventilation, air conditioning or refrigeration system, safety and regulatory requirements, developing alternative design schemes based on a design brief and customer requirements and documenting system designs.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ135A Design control systems for refrigeration or heating, ventilation and air conditioning systems

UEENEEJ130A Produce HVAC/R control system diagrams

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage

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Prerequisite Unit(s) **2)**

single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt

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Prerequisite Unit(s)	**2**)
	supply
	UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design complex refrigeration/HVAC control systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the proposed refrigeration/HVAC system is determined from the design brief or in consultations with appropriate person(s).

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Design development work is planned to meet scheduled timelines in consultation with others involved on the work site.
2	Design complex refrigeration/HVAC control systems	2.1	Knowledge of complex control processes and methods are applied to the design.
		2.2	Alternative concepts for the design are evaluated based on the requirements outlined in the design brief. (See Note)
		2.3	Safety, functional and budget considerations are incorporated in the design.
		2.4	System design draft is checked for compliance with the design brief and regulatory requirements.
		2.5	System design is documented for submission to appropriate person(s) for approval.
		2.6	Solutions to unplanned situation are provided consistent with organisation's policy.
3	Obtain approval for complex refrigeration/HVAC control systems design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
		3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
		3.3	Final design is documented and approval obtained from appropriate person(s).
		3.4	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

Note.
Design concepts should be evaluated by real or virtual prototyping where it cannot be shown easily by other means that particular aspects of the design met specified requirements.

Required Skills and Knowledge

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REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing complex control systems for heating, ventilation, air conditioning or refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ146A Complex HVAC/R control system design

Evidence shall show an understanding of complex HVAC/R control system design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Advanced HVAC/R control system design

- Control diagrams
  - Australian Standard and nonstandard symbols as used in a variety of typical HVAC/R
  - control diagrams.
  - electric/electronic control diagrams
  - electrical installation documents
  - pneumatic diagrams
  - DDC diagrams
  - controls/electrical power circuit interface
  - nomographs
  - extraction of specific information relating to the operation and control of plant from a variety of typical HVAC/R control diagrams.
  - development of control diagrams to required standards given specific system operating parameters.
- Control design requirements
  - standard and statutory requirements
  - economy of operation (energy management)
  - the desired or most appropriate system operating logic for a specified HVAC/R system.
  - appropriate mode of control for a specified HVAC/R system.
  - control system type selection for specific applications with due to regard to plant size, application, operating environment, available control power supply options, economy and computability to existing or proposed plant and control system.
  - components required to assemble and operate the control system of a specified HVAC/R system.

T2 HVAC/R system energy conservation methods

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REQUIRED SKILLS AND KNOWLEDGE

- HVAC system control
  - night cycle
  - optimum stop/start
  - purge cycles
  - chiller/boiler/cooling tower sequencing
  - economy cycles (based on temperature or enthalpy).
  - supply air reset
  - condenser water temperature reset
- electrical load control
  - power demand control
  - load limiting
  - load shedding
    - set point relaxation
  - ventilation cycles

T3 Building Management Systems

- Functions of a BMS:
  - autonomous Functions
    - input
    - output
    - general I/O
    - installation management items
    - energy management
    - risk management
  - information processing
  - objectives
    - building running costs
  - smoke control as per AS 1668 part 1
- BMS hardware:
  - system architecture
  - communication devices
  - substations
  - PC’s
  - interfaces with other systems
- Input and output functions:
  - digital - inputs/outputs
  - digital output with status feedback
  - analogue input/output
  - sensors

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REQUIRED SKILLS AND KNOWLEDGE

- alarms

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the

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assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design complex control systems for heating, ventilation, air conditioning or refrigeration systems as described in 8) and including:

A Developing outlines of alternative designs

B Developing the design within the safety, regulatory,

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functional requirements and budget limitations

C Documenting and presenting design effectively

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in designing complex control systems for heating, ventilation, air conditioning or refrigeration systems.

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EVIDENCE GUIDE

Method of assessment	**9**.**4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9**.**5**) For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit: UEENEEJ135A Design control systems for refrigeration or heating, ventilation, air conditioning or systems

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different complex control systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ147A Audit energy use for commercial HVAC/Refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers assessing the energy used by commercial HVAC andrefrigeration systems in relation to its performance for the purpose of improving efficiency and/or certification as meeting energy efficiency standards. It encompasses safe working practices, determining efficiency requirements, setting up performance and energy tests, evaluating results and documenting test outcomes.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting

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Application of the Unit **4**)

and risk safety measures

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ136A	Evaluate and report on building services energy management systems
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment

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Prerequisite Unit(s) **2)**

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits

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Prerequisite Unit(s) **2)**

UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to audit energy use for a commercial HVAC/R application	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	System assessment and testing area is checked for safety hazards and risk control measures implemented in strict accordance with safety policy and procedures.
		1.4	Relevant documentation is obtained and read to determine the performance/certification requirements against which the system is to be assessed. Note: Examples of documentation are those specifying safety requirements, technical standard and as marketed technical energy performance
		1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.6	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2	Audit energy use for a commercial HVAC/R application	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Circuits/apparatus/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.3	In depth knowledge of the performance and energy efficiency requirements of HVAC/R system and assessment methods are applied to the audit process.
		2.4	Apparatus assessment and tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
		2.5	System assessment and tests are carried out methodically and results and comments systematically noted.

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ELEMENT		PERFORMANCE CRITERIA	
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Auditing is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.
3	Document auditing activities and results	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Assessment and test results are evaluated and non-compliance issues identified.
		3.4	Assessment, test results and recommendations on non-compliance issues are documented and reported to appropriate person(s) in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and auditing energy use for commercial HVAC/R systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ147A HVAC/R energy audits

Evidence shall show an understanding of HVAC/R energy auditing, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Identification of major energy consuming plant

- review of HVAC/R system components

T2 Methods of energy conservation

- review of energy conserving strategies
- house keeping
- time schedules
- good maintenance practices
  - filters, fans, appropriate set points, dead bands etc.
- HVAC system control
  - night cycle
  - optimum stop/start
  - purge cycles
  - chiller/boiler/cooling tower sequencing
  - economy cycles (based on temperature or enthalpy).
  - supply air reset
  - condenser water temperature reset
- electrical load control
  - power demand control
  - load limiting
  - load shedding
  - set point relaxation
  - ventilation cycles

T3 Tests and data collection procedures

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REQUIRED SKILLS AND KNOWLEDGE

- use of BMS for data collection (trending)
- use of data recorders (loggers)
- monitoring of building operations generally

T4 Analyse results from test data

- compare against standards (BOMA)
- review current practices against ideal
- total consumption vs. peak load
- electricity tariffs and implications

T5 Methods of reducing energy usage

- plant retrofits
- controls - application of strategies
- plant - fixed OA to economy, boiler to electric reheat, and constant volume to VAV etc. cost/benefit (payback).

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment,

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the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Audit energy use for commercial HVAC/R systems as described in 8) and including:

A Interpreting performance/certification requirements correctly.

B Setting up and conducting appropriate system assessments and tests.

C Identifying non-compliance issues.

D Reporting assessment and test results and non-compliance issues and recommendations appropriately.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in auditing energy use for commercial HVAC/R systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to auditing energy use by at least two different commercial HVAC/R systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ148A Audit HVAC/R control systems for compliance with regulations and standards

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers control safety and performance evaluation of heating, ventilating, air conditioning and refrigeration control systems across their operating range. It encompasses working safely, setting up and conducting evaluation measurements, evaluating performance from measured parameters and documenting results and recommending any resulting corrective actions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ135A Design control systems for refrigeration or heating, ventilation and air conditioning systems

UEENEEJ130A Produce HVAC/R control system diagrams

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **2)**

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to audit HVAC/R control systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	Examination and testing area is checked for safety hazards and risk control measures implemented in strict accordance with safety policy and procedures.
		1.4	Relevant documentation is obtained and read to determine the performance/certification requirements against which the system is to be assessed. Note: Examples of documentation are those specifying safety requirements, technical standard and as marketed technical performance, product quality endorsement standards.

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.6	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2	Audit HVAC/R control systems for compliance with regulations and standards.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	In depth knowledge of the performance and energy efficiency requirements of HVAC/R system and assessment methods are applied to the audit process.
		2.5	Control system examination and tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
		2.6	Control system examination and tests are carried out methodically and results and comments systematically noted.
		2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.8	Assessment is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete auditing work and document results	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Examination and test results are evaluated and non-compliance issues identified.

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ELEMENT	PERFORMANCE CRITERIA	
	3.4	Examination, test results and comments on non-compliance issues are documented and reported to appropriate person(s) in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and auditing HVAC/R control systems for compliance with standards and regulations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ148A HVAC/R control system audits

Evidence shall show an understanding of HVAC/R control system audits, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 review of HVAC/R system components

T2 performance requirements of particular control applications from available system specifications, design briefs etc

T3 descriptions of operation

T4 measurements, recordings, etc. of system performance, as required to confirm plant control compliance with desired conditions.

T5 comparison of system specifications, control strategies, design briefs, and recorded test results with current HVAC/R energy management principles to establish the economy of operation of HVAC/R plant.

T6 preparation a detailed report outlining the results of investigation and stating suggested control system adjustments, alterations and modifications to improve the performance of the plant.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines

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of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

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EVIDENCE GUIDE

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Audit HVAC/R control systems for compliance with standards and regulations as described in 8) and including:

A Interpreting compliance documents

B Setting up and conducting appropriate examinations and tests

C Identifying non-compliance defects

D Reporting examination and test results and non-compliance issues clearly and accurately

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in auditing HVAC/R control systems for compliance with standards and regulations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to at least two different types of HVAC/R control systems encompassing at least four different control scenarios.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ149A Develop heat exchanger design specifications

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the analysis of refrigeration parameters and develop specification for heat exchanger design. It encompasses working safely, apply extensive knowledge of refrigeration parameters, gathering and analysing data, developing and documenting results and solutions for use in design work.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ138A Analyse vibration and noise in refrigeration and air conditioning systems

UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage

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Prerequisite Unit(s) **2)**

single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt

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Prerequisite Unit(s)	**2**)
	supply
	UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop specifications for exchanger designs	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of analysis to develop specifications is determined from design brief and situation reports and in consultations with relevant persons
		1.4	Activities are planned to meet scheduled timelines in

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ELEMENT		PERFORMANCE CRITERIA	
			consultation with others involved in the work.
		1.5	Effective strategies are formed to ensure analysis is carried out efficiently.
2	Develop specifications for exchanger designs.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of refrigeration parameters are applied to developing heat exchanger specifications.
		2.3	Parameters and performance requirements in relation to refrigeration systems are obtained in accordance with established procedures.
		2.4	Approaches to analysing refrigeration parameters are carried out to provide the most effective solution.
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
		2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3	Document specifications for exchanger design	3.1	Analysis is documented including details of all findings, calculations and assumptions.
		3.2	Specification for heat exchanger are developed from analysis findings and in accordance with established procedures
		3.3	Developed specification and analysis is reported to appropriately person(s) for endorsement.
		3.4	Justification for findings and any actions to be undertaken in relation to the design is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing specifications for heat exchanger designs.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ149A Heat exchanger design

Evidence shall show an understanding of heat exchanger design, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Advanced thermodynamics

- Heat transfer
  - Modes of heat transfer
  - Conduction through a flat plate, series flat plates, thick and
  - thin wall pipe, composite pipes (e.g. lagged pipes and drums)
  - Convection at a flat surface or tube
  - Radiation from a flat surface or tube for black or grey bodies
  - Combined conduction and convection through single or
  - multiple flat plates or thin wall tubes
  - Combined convection and radiation
  - Combined conduction, convection and radiation such as fluid
  - in a tank (convection to wall), through wall and/or insulation
  - (conduction) to outside air (convection and radiation)
  - Heat exchangers - parallel, counter flow and cross flow
- Refrigeration/heat pump
  - Basic principles and terminology
  - Vapour compression cycle
  - Performance criteria
  - Types of refrigerant - designation, properties advantages and disadvantages
  - Refrigerant properties using the p-h diagram
  - Ideal vapour compression cycle on the p-h diagram
  - Energy balance and heat transfers in compressor, evaporator and condenser
  - Actual vapour compression cycle and variations from the ideal
    - pressure loss in lines and non-ideal compression

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REQUIRED SKILLS AND KNOWLEDGE

- Superheating and subcooling with or without suction/liquid heat exchanger
- Carnot principle applied to refrigerator and heat pump
- Principles of evaporative refrigeration, absorption refrigeration, air cycle refrigeration and thermo-electric refrigeration

T2 Heater exchanger design

- Concepts
- Design parameters and limitations
- Construction material and components
- Testing requirements

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries

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risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop specifications for heat exchanger designs as described in 8) and including:

    A Interpreting compliance documents

    B Setting up and conducting appropriate examinations and tests

    C Identifying non-compliance defects

    D Reporting examination and test results and non-compliance issues clearly and accurately

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in developing specifications for heat exchanger designs.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to developing specifications for at least two different heat exchangers.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ150A Evaluate new and alternative technologies applicable to electrotechnology applications

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers evaluation of alternative and new technologies applicable to electrotechnology applications. It encompasses working safely, comparing manufacturer's technical data for alternative or new technologies with specifications for a proposed project, conducting evaluation tests, evaluating systems/components from technical data, calculations and/or measured parameters and reporting findings for use in design work.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of refrigeration or air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to evaluate and report on alternative and new technologies	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of evaluation is determined from proposed project specifications and discussion with appropriate personnel.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Tools, testing devices, and manufacture's technical data needed to carry out the work are obtained and checked for correct operation and safety.

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ELEMENT		PERFORMANCE CRITERIA	
2	Evaluate alternative and new technologies.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	In-depth knowledge of the electrotechnology discipline applicable to the alternative or new technology being considered is applied to the evaluation process.
		2.3	Manufacture's technical data for alternative or new technologies is compared with proposed project specifications, budget and regulations.
		2.4	Evaluation tests, where used, are set up in strict accordance with OHS requirements and established test methods for each particular component under scrutiny.
		2.5	Evaluation is carried out methodically and results and comments systematically noted.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Evaluation is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.
3	Report on use of alternative and new technologies	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Where applicable, the work site is cleaned and made safe in accordance with established procedures.
		3.3	Results of the evaluation are documented for use in design work including recommendations and justifications for adoption or rejection of the alternative and new technologies evaluated.
		3.4	Report is forwarded to appropriate person(s) for endorsement.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and evaluating alternative and new technologies applicable to electrotechnology applications.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ150A New and alternative technology sources

Evidence shall show an understanding of the sources of new and alternative technology development and processes for their adoption, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Sources of information on alternative or new technologies

- Industry organisations
- Industry technical journals
- Government and private research papers/literature
- Manufacturers' bulletins

T2 Comparison of technical data from different manufacturers

T3 Evaluating performance benefits and limitations of new and developed technologies for given applications, encompassing:

- Capital cost benefits
- Operations efficiency
- Risk hazardous and issues related to environmental and health and safety
- Functionality

T4 Processes to facilitate adoption

Note: Research; analyses; reporting; recommending; and the like, utilising a range of techniques, processes and technologies

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

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competency in this unit

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Evaluating alternative and new technologies applicable to electrotechnology applications as described in 8) and including:

A Determining the extent of the evaluation.

B Comparing manufacture's technical data for alternative or new technologies with proposed project specifications, budget and regulations accurately.

C Reporting evaluation including recommendations and justifications for adoption or rejection of the alternative and new technologies evaluated.

D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions

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	incorporated in the holistic assessment with the above listed items
Context of and specific resources for assessment	**9.3**) This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include: • OHS policy and work procedures and instructions. • Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit. These should be part of the formal learning/assessment environment. Note: Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy. Evidence should show demonstrated competency in evaluating alternative and new technologies applicable to electrotechnology applications.
Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to evaluating alternative and new technologies for two different proposed projects in any of the following electrotechnology disciplines.

- Automated systems
- Computer systems
- Electrical
- Electronics
- Industrial electronics and control
- Refrigeration and air conditioning
- Renewable energy

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ151A Service small electrical appliances and power tools

Modification History

Not Applicable.

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers maintaining the effective and efficient operation of small electrical appliances and hand power tools. It encompasses working safely, applying knowledge of small appliances and power tools, following service manuals, testing appliance function, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit may apply to persons entering work in electrotechnology and may be used in school based vocational programs.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

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Prerequisite Unit(s) **2)**

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

and

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE003B Solve problems in extra-low voltage single path circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to service small electrical appliances and power tools	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The nature of the repair is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
		1.6	Tools, apparatus and testing devices needed to carry out

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ELEMENT		PERFORMANCE CRITERIA	
			the work are obtained and checked for correct operation and safety.
2	Service small electrical appliances and power tools	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Apparatus is dismantled in accordance with manufacturer's guide and supervisor's instructions.
		2.5	Component parts are tagged during the dismantling to help ensure correct and efficient reassembly and stored to protect them against loss or damage.
		2.6	Repairs are affected efficiently without damage to other components, apparatus or circuits.
		2.7	Apparatus is assembled in an appropriate sequence with all parts placed, secured and connected in accordance with manufacturer's guide or industry practice.
		2.8	Procedures for referring non-routine events to immediate supervisor for directions are followed.
		2.9	Repairs are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Complete and report service work activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Repaired apparatus is prepared and forwarded to appropriate person(s) for testing.
		3.3	Work area is cleaned and made safe in accordance with established procedures.
		3.4	Work supervisor is notified of the completion of the repair work in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and servicing small appliances and power tools.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ151A Small electrical appliances and hand power tools

Evidence shall show an understanding of small electrical appliances and hand power tools, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects

T1 Types, applications, operating principles and characteristics

T2 Motors and drive mechanisms

T3 Control and over current protection methods and devices

T4 Typical hand power tool faults encompassing:

- Motor faults
- Power supply faults

Note. Examples include open circuit or tripped circuit in cord connected tools and battery charging and discharging problems in battery operated tools.

- Control faults
- Mechanical faults

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

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Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline,

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work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Service small appliances and power tools as described in 8) and including:

A Following manufactures service instructions for access to components

B Removing at least three different types of components specified in the work instructions

C Replacing components to manufacturers' requirements.

D Terminating internal wiring correctly.

E Reassembling the apparatus correctly

F Testing apparatus operation

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these

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cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing small appliances and power tools.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG006A	Solve problems in single and three phase low voltage machines

or

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UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) shall be reassessed in relation to this unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to servicing at least two different small appliances and two different power tools. These include the following:

- Small appliances: Toasters, garbage disposal units, food mixer/processors, small heating appliances (e.g. hair dryers), range hoods, etc.
- Hand Power Tools: Drills (pistol, hammer, cordless, screw driver), circular saws, mitre saws, routers, sanders, grinders, planers, cut off machines, heat guns, etc.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ153A Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers finding and repairing faults in motors and associated controls in refrigeration and air conditioning systems. It encompasses working safely, applying knowledge of motor systems and their controls, reading circuit diagrams, sketching diagrams from traced circuits, applying logical fault finding procedures, conducting repairs and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where appliances are connected to fixed wiring at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for servicing refrigeration or air conditioning appliance in particular when working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s)

2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the

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Prerequisite Unit(s) **2)**

	workplace
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to find and rectify faults	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The likely extent of work to be undertaken is envisaged from fault/breakdown reports and/or discussions with appropriate person(s).

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are accessed in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established procedures and checked for correct operation and safety.
2	Find and repair faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Equipment is checked as being correctly isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Fault finding is approached methodically drawing on knowledge of refrigeration and air conditioning motors and their controls using measured and calculated values of circuit/motor parameters.
		2.6	Equipment is dismantled where necessary and parts stored to protect them against loss or damage
		2.7	Suspected faulty motor, component or circuit is rechecked and its fault status confirmed.
		2.8	Replacement parts required to rectify faults are sourced and obtained in accordance with established procedures.
		2.9	Effectiveness of the repair is tested in accordance with established procedures.
		2.10	Apparatus is reassembled, finally tested and prepared for return to service.

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ELEMENT		PERFORMANCE CRITERIA	
		2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.12	Fault finding and repair activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Completion and report fault finding and repair activities	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares inventory.
		3.3	Maintenance work activities are documented in accordance with established procedures. (See Note)

Note.
Examples of documentation are component faults reports, test results, authorisations, permits, parts/component dispatch and stores records.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and rectifying faults in appliance motors and associated controls.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ153A Refrigeration and air conditioning motors and associated controls

Evidence shall show an understanding of refrigeration and air conditioning motors and associated controls, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Three phase induction motors

- Revise the principles of electromagnetism
- Phase sequence

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REQUIRED SKILLS AND KNOWLEDGE

- Three phase induction motor action
- Induction motor construction
  - stator construction
  - rotor construction
- Speed and slip
- Line and phase voltages
- Terminal block markings
- Motor nameplate details
- Motor rating
- Star and Delta connections
- Electrical isolation
- Electrical testing and fault finding
- Rotation reversal
- Maintenance requirements

T2 Three phase motor starters

- Types of three phase induction motor starters
  - Direct-on-line motor starters
    - characteristics, applications and limitations
    - line and control voltages
    - connection, testing and fault finding
  - Other motor starters – characteristics, applications and limitations
    - Star-delta
    - Auto-transformer
    - Part winding
    - Solid State (soft start)

T3 Three phase motor protection devices

- Motor protection
- Motor protection devices
  - star point overloads
- Types of protection devices
  - fuses and circuit breakers
  - thermal overload
  - magnetic overload
  - under voltage and overvoltage relays
  - electronic motor protection
- Isolation devices
- Timers
- Environmental protection

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REQUIRED SKILLS AND KNOWLEDGE

- Fault finding in three phase motor installations
- Motor circuit faults

T4 Split phase, single phase motors and starters

- Split phase single phase motors
- Development of starting torque in split phase induction motors
- Winding characteristics
- Construction details
- Starting
  - centrifugal switch
  - current coil relay
  - solid state relay
- Characteristics of a split phase motor
  - advantages
  - disadvantage
  - application
  - rating
  - speed
  - reversal
- Testing and fault finding

T5 Capacitor and shaded pole, single phase motor and starters

- Capacitor start motors
  - Characteristics
  - Switching mechanism
  - Applications
  - Motor reversal
- Capacitor start/capacitor run motors
  - Characteristics
  - Switching mechanism
  - Applications
  - Motor reversal
- Permanently split capacitor motors
  - Characteristics
  - Applications
  - Motor reversal
  - Capacitors
- Shaded pole induction motors
  - Advantages
  - Disadvantages

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REQUIRED SKILLS AND KNOWLEDGE

- Reversal
- Applications
- Motor faults and fault finding
  - Capacitor start types
  - Shaded pole motor type

T6 Series universal, single phase motors

- Basic motor principles
- Commutation
- Electromagnet field system
- Reversal
- Supply types, a.c. /d.c.
- Construction
- Characteristics
- Applications
- Reversal
- Faults
- Synchronous motor

T7 Single phase motor protection devices

- Motor protection
  - Environmental
  - Overheating
  - Thermal overload relay
  - Thermal disc overload
  - Internal overload
  - Protection against open circuit, under voltage and automatic restarting
- Testing and fault finding

T8 Single phase motor speed control devices

- Speed control methods
  - Pole changing method
  - Voltage control method
  - Inverter

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

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EVIDENCE GUIDE

competency in this unit

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and rectify faults in refrigeration and air conditioning system motors and associated controls as described in 8) and including:

A Envisaging the likely extent of work from fault/breakdown reports and discussion with appropriate person(s)

B Using methodical fault finding techniques

C Finding faults efficiently

D Rectifying faults effectively

E Completing documentation correctly

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EVIDENCE GUIDE

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in finding and rectifying faults in appliance motors and associated controls

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to finding and repairing the following faults, in single and/or three phase appliance motors and associated controls in each of three different types of refrigeration and air conditioning systems:

- Open-circuit
- Short-circuit
- Incorrect connections
- Insulation failure
- Unsafe condition
- Motor component failure
- Control circuit component failure
- Related mechanical failure

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ154A Find and rectify faults in appliance control systems and devices

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers finding and repairing faults in appliance control systems and devices. It encompasses working safely, applying knowledge of appliance control systems and devices, reading circuit diagrams, sketching diagrams from traced circuits, applying logical fault finding procedures, conducting repairs and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where appliances are connected to fixed wiring at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for servicing refrigeration or air conditioning appliance in particular when working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

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Prerequisite Unit(s) **2)**

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE003B Solve problems in extra-low voltage single path circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to find and rectify faults in appliance control systems and devices	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The likely extent of work to be undertaken is envisaged from fault/breakdown reports and/or discussions with appropriate person(s).
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are accessed in accordance with established procedures.

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established procedures and checked for correct operation and safety.
2	Find and repair faults in appliance control systems and devices	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Appliance is checked as being correctly isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Fault finding is approached methodically drawing on knowledge of appliance control systems and devices using measured and calculated values of circuit/control parameters.
		2.6	Appliance is dismantled where necessary and parts stored to protect them against loss or damage
		2.7	Suspected faulty control device, component or circuit is rechecked and its fault status confirmed.
		2.8	Replacement parts required to rectify faults are sourced and obtained in accordance with established procedures.
		2.9	Effectiveness of the repair is tested in accordance with established procedures.
		2.10	Apparatus is reassembled, finally tested and prepared for return to service.
		2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.12	Fault finding and repair activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy

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ELEMENT		PERFORMANCE CRITERIA	
			practices.
3	Completion and report fault finding and repair activities	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares inventory.
		3.3	Maintenance work activities are documented in accordance with established procedures. (See Note)

Note.
Examples of documentation are component faults reports, test results, authorisations, permits, parts/component dispatch and stores records.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and rectifying faults in appliance control devices and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ154A Appliance control systems and devices

Evidence shall show an understanding of control systems and devices used in domestic appliances, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Control systems and components encompassing:

- appliance controls,
- electrical/electronic controls,

T2 Control terminology

T3 Types of control

T4 Appliance characteristics and control parameters

T5 System responses to parameter changes

T6 Appliance integrated communications components and their function.

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REQUIRED SKILLS AND KNOWLEDGE

T7 Appliance diagnostic tools

- Types, construction, operation and application of electrical, electronic and mechanical diagnostic tools

  Note. Examples are appliance manufacturer specific diagnostic tools, binary code via LED display; Test instruments such as multimeters, clamp meters, insulation resistance meters, power analysers and high voltage testers; data loggers, microwave leak detectors, gas (hydrocarbon) detectors and sound meters
- Installation requirements, adjustments and safety encompassing:
  - Manufacturers' instructions and data
  - Installation safety
  - Effects and risks of electrical current and mechanical movement
  - Protection against indirect contact
- Computer and paper based diagnostic tools encompassing:
  - Appliance manufacturers programs

  Note. Examples are binary code via LED display, remote fault diagnosis via phone access and remote fault diagnosis via Internet
  - Text books and manufacturers data
- Service, fault finding and repair encompassing:
  - Manufacturers' data
  - Safety checks
  - Operating sequence
  - Typical symptoms
  - Fault identification using diagnostic tools
  - Confirmation of fault
  - Repairs limitations

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of 9.1)

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EVIDENCE GUIDE

Assessment

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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EVIDENCE GUIDE

shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Find and rectify faults in appliance control devices and systems as described in 8) and including:

A Envisaging the likely extent of work from fault/breakdown reports and discussion with appropriate person(s)

B Using methodical fault finding techniques

C Finding faults efficiently

D Rectifying faults effectively

E Completing documentation correctly

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in finding and rectifying faults in appliance control devices and systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to finding and repairing any four of the following faults in appliance control systems and devices in each of two different types of appliance.

- Open-circuit
- Short-circuit
- Incorrect connections
- Insulation failure
- Unsafe condition
- Motor component failure
- Control circuit component failure
- Related mechanical failure

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ155A Service refrigeration appliances

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers maintaining the effective and efficient operation of refrigerated appliances. It encompasses working safely, applying knowledge of refrigerated appliance, following service manuals, testing appliance function, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where appliances are connected to fixed wiring at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for servicing refrigeration or air conditioning appliance in particular when working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ154A Find and rectify faults in appliance control systems and devices

UEENEEJ162A Recover, pressure test, evacuate, charge and leak test refrigerants appliances

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ195A Establish the basic operating conditions of vapour compression systems - appliances

and

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Prerequisite Unit(s) **2)**

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE003B Solve problems in extra-low voltage single path circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to service refrigerated appliances	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The extent of work to be undertaken is determined from service/fault request and/or discussions with appropriate person(s).
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials/parts that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established

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ELEMENT		PERFORMANCE CRITERIA	
			procedures and checked for correct operation and safety.
2	Service refrigerated appliances	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Appliance is checked as being correctly isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Safety hazards resulting from the defect or fault are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Appliances are tested for efficient operation and components affecting efficiency are inspected for wear or defects in accordance with standards, manufacturer's service manuals and industry codes of practice.
		2.6	Appliance faults and their cause are identified through the application of refrigerated appliances and using measured and calculated values of appliance parameters.
		2.7	Appliance is dismantled where necessary and parts stored to protect them against loss or damage
		2.8	Defective, worn or faulty appliance components are rechecked and their status confirmed.
		2.9	Replacement parts required to rectify defects/faults are sourced and obtained in accordance with established procedures.
		2.10	Effectiveness of the repair is tested in accordance with established procedures.
		2.11	Apparatus is reassembled, finally tested and prepared for return to service.
		2.12	Unexpected situations are dealt with safely and with

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ELEMENT		PERFORMANCE CRITERIA	
			the approval of an authorised person.
		2.13	Servicing activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Completion and report fault finding and repair activities	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Service report is completed and verified by an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and servicing refrigerated appliances.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ155A Appliance refrigeration system servicing

Evidence shall show an understanding of servicing appliance refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Major appliances encompassing:

Note: Examples of major appliances are washing machines, clothes dryers, dishwashers, refrigerators, freezers, air conditioners, electrical and gas cookers and heaters

- Installation codes, statutory requirements and regulations
- Manufacturer and company installation requirements and warranty implications
- Site preparation and accessibility.
- Fixing and procedures and methods for connecting services.

T2. Operation principles of major domestic appliances that use electrical, gas and/or water services and/or incorporate refrigeration encompassing:

- Purpose and operational options.
- Functions of major components.

T3. Operational testing and set up procedures encompassing:

- Pre-start checking.
- Safety controls checking.
- Operating cycle testing and control adjustments

T4. Capillary systems

- Requirements of Domestic Refrigeration Code of Practice.
- Function, types, construction, characteristics and applications encompassing:
  - system unloading
  - calculating system operating pressures
  - critical length
  - critical charge
- Faults leading to repair/replacement of a capillary tubes

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REQUIRED SKILLS AND KNOWLEDGE

- Selection of replacement capillary tubes.
- Procedures for commissioning and servicing a capillary tube system.

T5. Appliance refrigeration systems

- Types, applications, construction, components and operating characteristics
- Typical component wear or defects
- Typical faults
- Component repair/replacement methods
- Manufactures' parts catalogues and service reports

T6. Retrofitting domestic refrigeration systems

- Reasons for retrofitting
  - Montreal Protocol
  - Kyoto Summit
  - Global warming
  - AS Codes of Practice
  - Acts and Regulations
- System Analysis
  - Equipment identification
  - Systems options
- Refrigerant selection
  - Safety considerations
  - ANSI / ASHRAE Standard 34
  - AIRAH Refrigerant Selection Guide
  - Transitional and drop in-refrigerants
  - Medium and long term refrigerants
  - Refrigerant selection considerations
  - Domestic refrigeration system performance testing
  - Refrigerant recovery, recycling or reclaim
  - Lubricant selection considerations
- Retrofit procedure:
  - Refrigerant recovery
  - Flushing procedures
  - Retrofit procedure for CFC/HCFC to blended refrigerants
  - Oil and drier replacement
  - Evacuation
  - Refrigerant charging
  - System labelling

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required

9.**2**)

Before the critical aspects of evidence are considered all

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EVIDENCE GUIDE

to demonstrate competency in this unit

prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Service refrigerated appliances as described in 8) and including:

A Determining the nature of the work from service request

B Identifying defective components affecting appliance efficiency

C Finding faults efficiently

D Rectifying defects/faults effectively

E Testing appliance functions effectively

F Completing service report accurately

G Dealing with unplanned events by drawing on essential

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knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing refrigerated appliances.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to servicing refrigerated appliances with any four of the following defects/faults in appliance refrigeration system in each of two different types of appliance.

- Higher energy use than previously experienced
- Not cold enough
- Appliance ices-up
- Appliance light not working
- Electric shock received from appliance cabinet

The types of refrigeration appliances include: single door refrigerators, two door refrigerators/freezers and single door freezers in either cyclic defrost or frost free.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ156A Service clothes washing machines and dryers

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers maintaining the effective and efficient operation of clothes washing machines and dryers. It encompasses working safely, applying knowledge of clothes washing machines and dryers, following service manuals, testing appliance function, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where appliances are connected to fixed wiring at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for servicing clothes washers and dryers. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ154A Find and rectify faults in appliance control systems and devices

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

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Prerequisite Unit(s)

2)

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE003B Solve problems in extra-low voltage single path circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to service cloth washing machines and dryers.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The extent of work to be undertaken is determined from service/fault request and/or discussions with appropriate person(s).
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials/parts that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established

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ELEMENT		PERFORMANCE CRITERIA	
			procedures and checked for correct operation and safety.
2	Service clothes washing machines and dryers.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Appliance is checked as being correctly isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Safety hazards resulting from the defect or fault are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Appliances are tested for efficient operation and components affecting efficiency are inspected for wear or defects in accordance with standards, manufacturer's service manuals and industry codes of practice.
		2.6	Appliance faults and their cause are identified through the application of refrigerated appliances and using measured and calculated values of appliance parameters.
		2.7	Appliance is dismantled where necessary and parts stored to protect them against loss or damage.
		2.8	Defective, worn or faulty appliance components are rechecked and their status confirmed.
		2.9	Replacement parts required to rectify defects/faults are sourced and obtained in accordance with established procedures.
		2.10	Effectiveness of the repair is tested in accordance with established procedures.
		2.11	Apparatus is reassembled, finally tested and prepared for return to service.

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ELEMENT		PERFORMANCE CRITERIA	
		2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.13	Servicing activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Service report is completed and verified by an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and servicing clothes washers and dryers.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ156A Clothes washing machines and dryers

Evidence shall show an understanding of clothes washing machines and dryers, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Types, applications, construction, components and operating characteristics

T2 Installation

- Installation codes, statutory requirements and regulations
- Manufacturer and company installation requirements and warranty implications
- Site preparation and accessibility.
- Fixing and procedures and methods for connecting services.

T3 Operational testing and set up procedures encompassing:

- Pre-start checking.
- Safety controls checking.
- Operating cycle testing and control adjustments

T4 Typical component wear or defects

T5 Typical faults

T6 Component repair/replacement methods

T7 Manufacturers' parts catalogues and service reports

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in

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conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

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competency in this unit

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Service clothes washers and dryers as described in 8) and including:

A Determining the nature of the work from service request

B Identifying defective components affecting appliance efficiency

C Finding faults efficiently

D Rectifying defects/faults effectively

E Testing appliance functions effectively

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F Completing service report accurately

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing clothes washers and dryers.

Method of assessment

9.**4**)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.**5**)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to servicing clothes washers and dryers with any four of the following defects/faults in appliance clothes washers and dryer systems in each of two different types of appliance.

- Washing machines
    - Higher energy use than previously experienced
    - Program selector not working correctly
    - Appliance light not working
    - Electric shock received from appliance cabinet
- Dryers
    - Heater not operating
    - Fan not working
    - Timer not working correctly
    - Electric shock received from appliance cabinet

The types of appliances include:

- Washing machines: Automatic washers (top load and front load), twin tub washers, washer/dryer combinations
- Clothes Dryers: Tumble and static

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ157A Service electrical heating appliances

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers maintaining the effective and efficient operation of electric heating appliances. It encompasses working safely, applying knowledge of electric heating appliances, following service manuals, testing appliance function, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where appliances are connected to fixed wiring at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for servicing electric heating appliances. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ154A Find and rectify faults in appliance control systems and devices

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

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Prerequisite Unit(s) **2)**

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE003B Solve problems in extra-low voltage single path circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to service electrical heating appliances.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The extent of work to be undertaken is determined from service/fault request and/or discussions with appropriate person(s).
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials/parts that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established

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ELEMENT		PERFORMANCE CRITERIA	
			procedures and checked for correct operation and safety.
2	Service electrical heating appliances.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Appliance is checked as being correctly isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Safety hazards resulting from the defect or fault are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Appliances are tested for efficient operation and components affecting efficiency are inspected for wear or defects in accordance with standards, manufacturer's service manuals and industry codes of practice.
		2.6	Appliance faults and their cause are identified through the application of refrigerated appliances and using measured and calculated values of appliance parameters.
		2.7	Appliance is dismantled where necessary and parts stored to protect them against loss or damage.
		2.8	Defective, worn or faulty appliance components are rechecked and their status confirmed.
		2.9	Replacement parts required to rectify defects/faults are sourced and obtained in accordance with established procedures.
		2.10	Effectiveness of the repair is tested in accordance with established procedures.
		2.11	Apparatus is reassembled, finally tested and prepared for return to service.

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ELEMENT		PERFORMANCE CRITERIA	
		2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.13	Servicing activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Service report is completed and verified by an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and servicing electric heating appliances.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ157A **Electric heating appliances**

Evidence shall show an understanding of electrical heating appliances, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Heating principles and applications

Note. Principles include resistance, induction and microwave.

T2 Types of heating appliances, their operating principles and characteristics

Types include ovens, cook tops, space heaters, but excludes microwave ovens

T3 Heating circuits and controls

T4 Typical faults

T5 Faulty components repair/replacement methods

T6 Manufactures' parts catalogues and service reports

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to

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assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Service electric heating appliances as described in 8) and including:

A Determining the nature of the work from service request

B Identifying defective components affecting appliance efficiency

C Finding faults efficiently

D Rectifying defects/faults effectively

E Testing appliance functions effectively

F Completing service report accurately

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing electric heating appliances.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to servicing electric heating appliances with any three of the following defects/faults in electric heating systems in each of two different types of appliance.

- Heater not operating
- Fan not working
- Timer not working correctly
- Electric shock received from appliance cabinet

The types of appliances include: Electric stoves, ovens, hot plates and ranges, space heaters, and hot water systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ158A Service dishwasher machines

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers maintaining the effective and efficient operation of dish washing machines. It encompasses working safely, applying knowledge of dish washing machines, following service manuals, testing appliance function, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where appliances are connected to fixed wiring at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for servicing dish washing machines. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ154A Find and rectify faults in appliance control systems and devices

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

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Prerequisite Unit(s)

2)

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE003B Solve problems in extra-low voltage single path circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to service dish washing machines.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The extent of work to be undertaken is determined from service/fault request and/or discussions with appropriate person(s).
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials/parts that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to locate

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ELEMENT		PERFORMANCE CRITERIA	
			faults are obtained in accordance with established procedures and checked for correct operation and safety.
2	Service dishwashing machines.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Appliance is checked as being correctly isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Safety hazards resulting from the defect or fault are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Appliances are tested for efficient operation and components affecting efficiency are inspected for wear or defects in accordance with standards, manufacturer's service manuals and industry codes of practice.
		2.6	Appliance faults and their cause are identified through the application of refrigerated appliances and using measured and calculated values of appliance parameters.
		2.7	Appliance is dismantled where necessary and parts stored to protect them against loss or damage.
		2.8	Defective, worn or faulty appliance components are rechecked and their status confirmed.
		2.9	Replacement parts required to rectify defects/faults are sourced and obtained in accordance with established procedures.
		2.10	Effectiveness of the repair is tested in accordance with established procedures.
		2.11	Apparatus is reassembled, finally tested and prepared for return to service.
		2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.13	Servicing activities are carried out without damage to apparatus, circuits, the surrounding environment or

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ELEMENT		PERFORMANCE CRITERIA	
			services and using sustainable energy practices.
3	Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Service report is completed and verified by an appropriate person in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and servicing dish washing machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ158A **Dishwasher machines**

Evidence shall show an understanding of dish washer machines, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Types, applications, construction, components and operating characteristics

T2 Typical component wear or defects

T3 Typical faults

T4 Faulty component repair/replacement methods

T5 Manufacturers' parts catalogues and service reports

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Service dish washing machines as described in 8) and including:

A Determining the nature of the work from service request

B Identifying defective components affecting appliance efficiency

C Finding faults efficiently

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D Rectifying defects/faults effectively

E Testing appliance functions effectively

F Completing service report accurately

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing dish washing machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

There are no concurrent assessment recommendations for this

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other units unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to servicing dish washing machines with any four of the following defects/faults in the dish washing machine system in each of two different types of appliance.

- Not enough or too much water entering machine
- No wash cycle
- No rinse cycle
- Heater not operating
- Timer not working correctly
- Electric shock received from appliance cabinet

The types of dish washing machines include: Automatic washers, side load, front load, and semi-automatic.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ159A Service gas heating appliances

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers maintaining the effective and efficient operation of gas heating appliances. It encompasses working safely, applying knowledge of the gas appliance, following service manuals, testing appliance function, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where appliances are connected to fixed wiring at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for servicing gas appliances. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ154A Find and rectify faults in appliance control systems and devices

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology

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Prerequisite Unit(s)	**2)**
	equipment
	UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications
	UEENEEG101A Solve problems in electromagnetic devices and related circuits
	UEENEEG102A Solve problems in low voltage a.c. circuits
	UEENEEG106A Terminate cables, cords and accessories for low voltage circuits
	or
	UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
	UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications
	UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants
	UEENEEJ194A Solve problems in low voltage refrigeration circuits
	UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace
	UEENEEE003B Solve problems in extra-low voltage single path circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to service gas heating appliances.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The extent of work to be undertaken is determined from service/fault request and/or discussions with appropriate person(s).
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials/parts that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established

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ELEMENT		PERFORMANCE CRITERIA	
			procedures and checked for correct operation and safety.
2	Service gas heating appliances.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Appliance is checked as being correctly isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Safety hazards resulting from the defect or fault are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Appliances are tested for efficient operation and components affecting efficiency are inspected for wear or defects in accordance with standards, manufacturer's service manuals and industry codes of practice.
		2.6	Appliance faults and their cause are identified through the application of refrigerated appliances and using measured and calculated values of appliance parameters.
		2.7	Appliance is dismantled where necessary and parts stored to protect them against loss or damage.
		2.8	Defective, worn or faulty appliance components are rechecked and their status confirmed.
		2.9	Replacement parts required to rectify defects/faults are sourced and obtained in accordance with established procedures.
		2.10	Effectiveness of the repair is tested in accordance with established procedures.
		2.11	Apparatus is reassembled, finally tested and prepared for return to service.

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ELEMENT		PERFORMANCE CRITERIA	
		2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.13	Servicing activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Service report is completed and verified by an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and servicing dish washing machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ159A Gas heating appliances

Evidence shall show an understanding of gas heating appliances, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Types, applications, construction, components and operating characteristics

Types include ovens, cook tops, space heaters

T2 Typical component wear or defects

T3 Typical faults

T4 Component repair/replacement methods

T5 Manufacturers' parts catalogues and service reports

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably

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gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Service dish washing machines as described in 8) and including:

A Determining the nature of the work from service request

B Identifying defective components affecting appliance efficiency

C Finding faults efficiently

D Rectifying defects/faults effectively

E Testing appliance functions effectively

F Completing service report accurately

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing dish washing machines.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to servicing gas appliances with any four of the following defects/faults in appliance gas system in each of two different types of appliance.

- No pilot flame
- No main jet ignition
- Not hot enough
- Timer not working correctly
- Electric shock received from appliance cabinet
- Gas leaking

The types of gas appliances include: Stoves, ovens, hot plates and ranges, space heaters, and hot water systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ161A Verify functionality and compliance of appliances

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers testing and visually inspecting appliances to verifying that they are safe and comply with requirements. It encompasses procedures for conducting safety and functionality tests, conducting visual inspections, identifying non-compliance defects, documenting results and recommendations and initiating the rectification of any defect.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle electrotechnology components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document occupational hazards and risks in an electrotechnology environment
UEENEEJ102A	Prepare and connect refrigeration tubing

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Prerequisite Unit(s)	**2)**	
		and fittings
	UEENEEJ151A	Service small electrical appliances and power tools
	UEENEEJ153A	Find and rectify faults in motors and associated controls in refrigeration and air conditioning systems
	UEENEEJ154A	Find and rectify faults in appliance control systems and devices
	UEENEEJ155A	Service refrigeration appliances
	UEENEEJ156A	Service clothes washing machines and dryers
	UEENEEJ162A	Recover, pressure test, evacuate, charge and leak test refrigerants - appliances
	UEENEEJ194A	Solve problems in low voltage refrigeration circuits
	UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances
	UEENEEK042A	Participate in environmentally sustainable work practices
	UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
	UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
	UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
	UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to verify functionality and compliance of appliances	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Inspection and tests are appropriately sequenced in accordance with job schedule.

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ELEMENT		PERFORMANCE CRITERIA	
		1.6	Materials needed for the tests and verification are obtained in accordance with established procedures and checked against job requirements
		1.7	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety
2	Visually inspect appliances	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Appliances are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.3	Accessories and components are validated as being appropriately rated and meeting functional requirements.
		2.4	Evidence that equipment complies with safety and functional requirements is cited.
		2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Inspection is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Conduct tests	3.1	OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Testing or measuring on a live and operating system in strict accordance with OHS requirements and within established safety procedures
		3.3	Appliances are checked as being isolated in strict accordance OHS requirements and procedures
		3.4	Electrical tests are conducted to verify that the

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ELEMENT		PERFORMANCE CRITERIA	
			electrical circuit within the appliance is safe and function as intended.
		3.5	Refrigeration tests are conducted to verify that the refrigeration components and pipe work within the appliance is safe and functions as intended.
		3.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		3.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
		3.8	Testing is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
4	Report inspection and verification findings	4.1	OHS work completion risk control measures and procedures are followed.
		4.2	Appliance is cleaned and made safe in accordance with established procedures.
		4.3	Non-compliance defects are identified and reported in accordance with established procedures.
		4.4	Recommendations for rectifying defects are made in accordance with established procedures.
		4.5	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and verifying compliance and functionality of appliances.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ161A Appliance, testing and compliance verification methods

Evidence shall show an understanding of appliance testing and compliance verification, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1	Mandatory testing and verification requirements.
T2	Appliance efficiency
T3	Testing techniques
T4	Visual inspection methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred

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EVIDENCE GUIDE

model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Verify compliance and functionality of appliances as described in 8) and including:

    A Identifying visual defects

    B Conducting all electrical tests safely and correctly

    C Conducting all refrigeration tests safely and correctly

    D Identifying non-compliant defects from test results

    E Recommending appropriate corrective actions

    F Acting within regulatory limits

    G Reporting legibly and accurately

    H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in verifying compliance and functionality of appliances.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to servicing room air conditioners with any four of the following defects/faults in appliance refrigeration system in each of two different types of appliance.

- Visual inspection of appliances
- Conducting all electrical tests

Note:
1. Electrical testing include isolation testing; insulation resistance of equipment; resistance of the internal circuits of equipment; polarity of supply and equipment; continuity of earthing; correct electrical connections load current.
2. Electrical testing may be limited by the scope permitted under restricted electrical work

- Conducting all refrigeration tests

Note:
Refrigeration testing includes pressure test apparatus/circuits: leak test apparatus/circuits; evacuation test apparatus/circuits; compressor efficiency; controls tests; refrigerant charge; operating pressures; system operation system capacity

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ162A Recover, pressure test, evacuate, charge and leak test refrigerants - appliances

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the recovery of refrigerants from appliances, pressure and leak testing evacuation and charging refrigerants in self contained appliances. It encompasses working safely and to standards, following regulations and industry practices for handling refrigerants and completing the necessary documentation.

Note:

1. Refrigeration systems may be those used for refrigerating or for air conditioning.

2. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 may apply to this competency standard unit. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

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Application of the Unit

4)

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some States/Territories, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

3. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 may apply to this competency standard unit. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ102A	Prepare and connect refrigeration tubing and fittings
UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances
UEENEEE1	Apply Occupational Health and Safety regulations, codes

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Prerequisite Unit(s) **2**)

2.1) **Competencies**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

01A and practices in the workplace

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to recover refrigerants, pressure and leak test, evacuate and charge refrigeration	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT	PERFORMANCE CRITERIA	
appliance.		
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
	1.4	The nature and location of the work is determined from documentation or appropriate person(s) to establish the scope of work to be undertaken.
	1.5	The work is appropriately sequenced in accordance with job schedule
	1.6	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.7	Refrigerants, lubricants and cleaning materials needed for the work are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.9	Preparatory work is checked to ensure no damage has occurred and complies with requirements
2 Recover refrigerants, pressure and leak test, evacuate and charge refrigeration appliance.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Checks are carried out to ensure the system or component parts are isolated, when necessary, in strict accordance with OHS requirements and procedures
	2.3	Circuits/machines/plant are checked as being electrically isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Refrigerants are removed from a appliance safely into suitably labelled containers in accordance with regulatory requirements and industry practices.
	2.5	Precautions are taken to prevent damage to

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ELEMENT		PERFORMANCE CRITERIA	
			components while pressure testing the appliance.
		2.6	Pressure testing is conducted using dry nitrogen at a pressure relative to the refrigerant to be used.
		2.7	Leaks are located and rectified using testing methods appropriate to the appliance under test and in accordance with industry practices.
		2.8	Appliances are evacuated to the required level and cleaned the appliance of all moisture and other containments in accordance with industry practices.
		2.9	A 'Drop test' is used to prove effectiveness of the evacuation in accordance with industry practice using an appropriate electronic vacuum gauge.
		2.10	Components lubricants are checked and maintained in accordance with manufacturer's requirements.
		2.11	Appliances are charged with the appropriate refrigerant in accordance with manufacturer's requirements and industry practices.
		2.12	Problematic situations that arise during the work are dealt with in an appropriate manner.
		2.13	Appliances are pressure and leak tested, evacuated and charged efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3	Complete and report refrigerants recovery, pressure and leak test and evacuate and charge work	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site and equipment is cleaned and made safe in accordance with established procedures.
		3.3	Contaminated refrigerant is dealt with in accordance with legislative/regulatory requirements.
		3.4	Completion of the work is documented and an appropriate person or persons notified in accordance

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ELEMENT	PERFORMANCE CRITERIA
	with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and recovering, pressure and leak testing, evacuating and charging refrigerants appliances.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ162A Appliance Refrigerants and lubricants

Evidence shall show an understanding of refrigerants and lubricants used in self contained appliances, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Introduction to refrigerants

- Purpose of refrigerant
- Ideal properties
- Pure, azeotropic, zeotropic and blend refrigerants
- General safety requirements and personal protection equipment

T2 Relevant Acts, Regulations, Codes and Standards

- The ozone layer (function, ozone depleting substances)
- The ozone protection act and regulation
- State and federal agencies (Dept of the environment, water, heritage and the arts; Dept of climate change; Australian Refrigeration Council Ltd etc)
- State and federal licensing requirements
- Refrigerant handling code of practice
- Relevant Standards
  - Standards philosophy and format
  - How to read and apply a standard
- Equipment manufactures specifications

T3 Refrigerant properties

- Commonly used types used in appliances, including CFC, HCFC, HFC, high pressure and natural refrigerants
- Terms (blend, azeotrope, zeotrope, glide, CFC, HCFC, HFC, HC, bubble point, dew point, critical point, ODP, GWP etc)
- Typical properties and applications of the current refrigerants used in appliances (boiling point, glide, composition (components), comparative latent heat

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REQUIRED SKILLS AND KNOWLEDGE

performance etc)

T4 Safe handling of refrigerants

- Refrigerant identification and the numbering system (AS 1677 part 1 sect 3)
- System refrigerant identification (labeling requirements, Code of Practice)
- Typical hazards (classification groups - AS 1677 part 1 sect 2 and handling precautions - inhalation, skin contact, cardiac sensitization, decomposition, reaction with moisture etc)
- Personal safety (MSDS - all common refrigerants plus phosgene, recommended PPE)
- Cylinders (cylinder terminology (WC, tare etc), transporting safely)
- Safe Filling (density and water capacity methods)
- Decanting methods (pumping, temperature differential etc)
- Recovery cylinders and their safe filling.
- Disposal of recovered refrigerants (including RRA)

T5 Refrigeration oil

- Types (mineral, POE, AB etc) used in appliances and their applications
- Basic properties (miscibility, dielectric strength, viscosity and hygroscopic abilities)
- Typical issues regarding compatibility (neoprene and POE, POE and mineral etc
- Safe handling (MSDS - POE's, Mineral, AB's - Residual acid's in used oils
- Applications for the various compressor lubricants used in the trade

T6 Recovery and reclaim procedures

- Refrigerant recovery systems and procedures
  - Vapour
  - Liquid
- Recovery cylinders
- Disposing of recovered refrigerants
- Safety and general issues when recovering refrigerant

T7 Pressure testing

- Pressure testing
- Pressure testing procedures and test pressures per Standards,
- Codes, Regulations and manufacturers requirements
- Safety and general issues when pressure testing refrigeration systems

T8 Leak detection

- Leak detector types and applications (electronic, halide, bubble, ultra violet, etc)
- Hazards and related safe working practices (working around rotating machinery, open flames, ultra violet light etc)
- Care and maintenance (delicate electronic equipment, changing sensor tip filters,

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REQUIRED SKILLS AND KNOWLEDGE

changing gas cartridges etc)

- Calibration (auto calibrating , send to a specialist etc)
- Leak testing methods

T9 Evacuation and dehydration

- Evacuation and dehydration
  - Deep vacuum methods
  - Triple evacuation
- Vacuum Measurement
  - Instruments
  - Drop test
- Vacuum Pumps
  - Types, size and applications
  - Use and connections
  - Care and maintenance
- Safety and general issues when evacuating refrigeration systems

T10 Refrigerant and oil charging

- Refrigerant cylinders, storage and safe handling
- Refrigerant charging methods
  - Vapour
  - Liquid
- Safety and general issues when charging refrigeration systems including personal protection equipment
- Refrigerant oil removal and addition tools, procedures and safety

T11 System contamination

- Contaminants (Non-condensables, moisture, acids, carbon, copper etc)
- Effects of contamination (Acid, motor burnout, oil contamination, copper plating, seizing, RMD blockage, excessive condensing temps etc)
- Practices/procedures that cause contamination
- Methods and components use to remove contamination
  - Filter dryers – liquid, suction, burnout
  - Dry nitrogen
  - Flushing agents
- Evacuation

T12 Basic refrigeration component replacement

- Risks of working with refrigerants and rotating equipment
- Refrigerant recovery
- Prevention of system contamination
- Protection of damage to surrounding equipment/ environment

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REQUIRED SKILLS AND KNOWLEDGE

- Replace basic components on a refrigeration system, for example filter dryer.

Pressure testing, evacuation, checking refrigerant charge, refrigerant charging and leak detection

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and

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EVIDENCE GUIDE

operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Recover, pressure and leak test, evacuate and charge refrigerants appliances as described in 8) and including:

A Selecting appropriate materials and equipment

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EVIDENCE GUIDE

B Removing and storing refrigerant correctly

C Conducting pressure testing at the appropriate pressure level and without damaging components

D Locating and rectifying leaks

E Evacuating the system to the required level

F Evacuating the system to the required standard and using appropriate vacuum measuring instruments

G Completing the necessary documentation.

H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in recovering, pressure and leak testing, evacuating and charging refrigerants appliances.

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EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to testing and charging refrigeration appliances used for refrigeration or air conditioning using appropriate vacuum measuring instruments encompassing the following:

- Recovering refrigerant from an existing appliance that may contains contaminants
- Pressure and leak testing a newly installed or repaired appliance
- Evacuating a appliance in preparation for charging with refrigerant
- Charging an appliance with refrigerant with minimal loss.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the analysis the operating parameters of heating, ventilating and air conditioning air and hydronic systems to determine whether performance requirements are being met. It encompasses working safely, apply knowledge of operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting results and solutions for use in design work.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies and is suitable for institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ192A: Analyse the psychrometric performance of HVAC/R systems

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

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Prerequisite Unit(s) **2)**

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to analyse the operation of HVAC air and hydronic systems	1.1	OHS processes and procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of operating analysis is determined from performance specifications and situation reports and in consultations with relevant persons
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
		1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.

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ELEMENT		PERFORMANCE CRITERIA	
2	Analyse the operation of HVAC air and hydronic systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of HVAC air and hydronic systems operating parameters is applied to analytical solutions to refrigeration and air conditioning systems.
		2.3	Parameters, specifications and performance requirements in relation to HVAC air and hydronic systems are obtained in accordance with established procedures.
		2.4	Approaches to analysing operating parameters are carried out to provide the most effective solution.
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
		2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3	Document and report on the results of the operation of HVAC/R systems analysis and actions taken.	3.1	Results of system operating analysis are evaluated to determine whether performance requirements are being met.
		3.2	Analysis is documented including details of all findings, calculations and assumptions.
		3.3	Analysis is reported to appropriately personnel to establish appropriate action to be taken based on findings.
		3.4	Justification for findings and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and analysing the operation of HVAC air and hydronic systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ164A HVAC air systems

Evidence shall show an understanding of heating, ventilation and air conditioning (HVAC) air systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Air distribution principles

- air diffuser selection
- factors affecting the design of ductwork systems
- types of ductwork systems
- static, velocity and total pressure
- laminar and turbulent flow
- moody diagram
- parameters that control cost

T2. Pressure loss

- friction and dynamic
- Colebook - White formula
- in ducts, friction charts
- in fittings, loss co-efficient
- fitting selection criteria
- diffuser pressure loss

T3. System sizing

- velocity method
- equal friction method
- static regain method
- balanced pressure drop method
- circular to rectangular equivalent
- standard duct sizes and gauges
- balancing

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REQUIRED SKILLS AND KNOWLEDGE

T4. Heat and leakage losses

- heat gain/loss calculation
- bare vs. insulated
- leakage

T5. Overview of noise in duct systems

- noise sources in duct systems
- attenuation
- impact on design
- methods of control

T6. Fans

- types and characteristics
- fan laws
- system effect
- fan selection
- fan and system curves

T7. Air systems

- dual and single duct constant volume
- variable volume
- induction units
- multi-zone
- diversity factors

KS02-EJ164A HVAC systems

Evidence shall show an understanding of heating, ventilation and air conditioning (HVAC) hydronic systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Systems operation

- closed/open systems
- pump head/lift, static head (high rise building)
- system friction losses
- nett positive suction head
- system curves

T2. Pumps

- types
- selection criteria
- performance characteristics
- bladder tanks
- coil characteristics

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REQUIRED SKILLS AND KNOWLEDGE

- heat exchangers: plate, shell and tube, tube in tube
- flow measurements: types
- flow switchers
- builders: types and performance characteristics
- cooling towers: elementary cooling thermodynamics and types

T3. Valves - flow control devices

- types and applications
- throttling characteristics
- flow measurements
- selection and applications

T4. Piping systems

- balancing and commissioning
- air venting
- water treatment
- vacuum breaking and air breaks

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in

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EVIDENCE GUIDE

accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse the operation of HVAC/R systems as described in 8) and including:

A Understanding the operating performance

B Forming effective strategies for analysing air conditioning systems performance

C Obtaining operating parameters, specifications and performance requirements appropriate to each situation.

D Evaluating the results of the analysis

E Documenting analysis details of all findings, calculations and assumptions.

F Documenting justification of actions to be implemented in accordance with professional standards.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In

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EVIDENCE GUIDE

these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in analysing the operation of HVAC/R systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to analysing operating parameters in at least two different HVAC systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers evaluation of thermodynamic and fuild parameters of refrigeration systems. It encompasses working safely, setting up and conducting evaluation measurements, evaluating thermodynamic and fluid parameters from measured parameters and reporting results for use in design work.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of refrigeration or air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A 0r Analyse the thermodynamic performance of HVAC/R systems

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

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Prerequisite Unit(s) **2)**

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite

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Prerequisite Unit(s)	**2**)
	appliances connected to low voltage installation wiring
	UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures
	UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
	UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to evaluate fluid and thermodynamic parameters of	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT		PERFORMANCE CRITERIA	
	refrigeration systems		
		1.3	The extent of evaluation is determined from specifications for the refrigeration system and discussion with appropriate personnel.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2	Evaluate fluid and thermodynamic parameters of refrigeration systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	In-depth knowledge of the fluid and thermodynamic parameters is applied to the evaluation process
		2.4	Energy evaluation tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
		2.5	Fluid and thermodynamic parameters evaluation tests are carried out methodically and results and comments systematically noted.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Evaluation is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.
3	Report on evaluation of fluid and thermodynamic parameters of refrigeration systems	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Results of fluid and thermodynamic parameters evaluation are documented for use in design work
	3.4	Energy evaluation report is forwarded to appropriate person(s) for endorsement.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and evaluating fluid and thermodynamic parameters of refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ165A Thermodynamics and fluid fundamentals

Evidence shall show an understanding of refrigeration engineering mathematics, thermodynamics and fluid fundamentals, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Matrices

- The operations: addition (subtraction), scalar multiplication, matrix multiplication up to 3x3 matrices.
- Identity matrix, inverse matrix
- Elementary algebraic manipulation of matrices
- Solve up to three equations (linear) in three unknowns using inverse matrices and determinants.

T2. Quadratic Functions

- Graphs of quadratic functions represented by parabolas and significance of the leading coefficient
- Zeros represented graphically
- Solve quadratic equations by factoring and quadratic formula
- Solve simultaneously linear and quadratic equations algebraically and geometrically.
- Engineering Mathematics- B

T3. Exponential and Logarithmic Functions

- Laws of indices
- Graph of f(x) = kabx, emphasising a = 10, e
- Definition of the logarithm to any base
- Graph of f(x) = k loga bx, emphasising a = 10, e
- Solve exponential and simple log equations using indices, logs, calculator, graphically
- Change of log base, emphasising 10 and e
- Growth and decay

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REQUIRED SKILLS AND KNOWLEDGE

T4. Trigonometric Functions

- The ratios: sin, cos, tan, cosec, sec, cot
- Degrees, radians
- Graphs of k f(ax + b) where f(x) = sin x, cos x, tan x, and significance of k,a,b, for example V = Vm sin (wt+ f)
- Trigonometric identities
- Solve trigonometric equations

T5. Energy and humanity

- Need for energy and relationship between energy usage and standard of living
- Energy conversion - typical processes and efficiencies
- Sources of energy
- Solar energy - direct heating, photosynthesis, solar cells, power tower, hydrogen for solar energy, ocean thermal energy collector, solar ponds, wind and wave energy, hydro-electric power
- Geothermal energy
- Tidal energy
- Nuclear energy - fission and fusion, burner and breeder reactors
- Stored fuel reserves
- Fuel conservation - reduction in wastage, recycling, greater usage efficiency and use of waste heat
- Thermodynamics

T6. Basic Concepts

- Nature of matter - atoms, molecules, inter-molecular forces, molecular motion, states of matter
- Mass and conservation of mass principle
- Volume, density, specific volume, relative density
- Force, weight, pressure (atmospheric, gauge and absolute)
- Temperature (Celsius and Kelvin)
- Systems and black box analysis
- Reciprocating piston and cylinder mechanism – pressure ratio and compression ratio

T7. Energy

- Definition and principles
- Potential energy
- Kinetic energy
- Work (linear and rotational), constant and variable force, relationship to pressure and volume change
- Power (linear and rotational)
- Sensible heat - specific heat capacity (constant pressure and constant volume)

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REQUIRED SKILLS AND KNOWLEDGE

- Latent heat
- Chemical energy - energy content of a fuel
- Internal energy
- Energy transfer in closed and open systems
- Definition of a closed system
- Calorimetry as an example of a closed system (with or without phase change)
- Thermodynamics 1
- Non-flow energy equation - typical applications such as stirring with simultaneous heating or cooling
- Definition of an open system
- Mass and volume flow rate and continuity equation
- Steady flow energy equation (negligible change in kinetic or potential energy) leading to the concept of enthalpy - typical applications such as turbines, compressors, boilers and heat exchangers.

T8. Gases

- Definition of a perfect or ideal gas in terms of the molecular model
- General gas equation
- Characteristic gas equation (equation of state)
- Constant pressure process
- Constant volume process
- Isothermal process
- Polytropic process
- Adiabatic process

T9. Heat engines

- Definition of a heat engine
- Essentials of a heat engine - heat source, heat sink, working substance, mechanical power output, working cycle
- Energy balance for a heat engine (as a black box) and efficiency
- Maximum possible efficiency (Carnot efficiency)
- Types of heat engines according to working substance, heat source, mechanical arrangement and working cycle
- Typical practical cycles - Stirling, Otto, Diesel, dual, two stroke (spark and compression ignition. Joule cycle.
- Thermodynamics 1

T10. Heat engine performance

- Measurement of torque and power output - rope brake, shoe brake, hydraulic dynamometer, electric dynamometer
- Heat supply rate, efficiency, specific fuel consumption
- Measurement of indicated power - mechanical indicator, electric/electronic indicator, Morse test

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REQUIRED SKILLS AND KNOWLEDGE

- Friction power, mechanical efficiency, indicated thermal efficiency
- Volumetric efficiency
- Energy balance
- Performance curves - variable load constant speed, variable speed constant throttle setting.

T11. Basic properties of fluids

- Description of a fluid and the difference between solids and fluids, liquids and gases, hydraulics and pneumatics
- Chemical properties, reaction with metals, corrosiveness, flammability, toxicity, pollution and environmental
- effects
- Dissolves gases and particles in liquids (slurries)
- Foaming of liquids. Basic properties and units - mass, volume, density, specific volume, relative density, force and weight, pressure (absolute, atmospheric and gauge), temperature (Celsius and Kelvin), viscosity, surface tension
- Vapour pressure of a liquid - saturation vapour pressure
- Temperature and pressure effects on the basic properties
- Ideal/perfect gases and liquids
- Gas laws for ideal gases
- Fluid Mechanics 1

T12. Components

- Pipes, channels, tubes and ducts (rigid and flexible)
- Valves - gate, globe, non-return/foot, needle, ball, plug cock, diaphragm, pressure regulating/reducing, safety
- valves
- Filters and strainers for gases and liquids
- Gauges and instruments - pressure and temperature gauges, liquid level gauges, thermometers, thermocouples, manometers, piezometers
- Pipe fittings - elbows/bends, enlargement/contractions, coupler/unions, tees
- Tanks and vessels - storage tanks, pressure vessels, header and surge tanks, weirs/dams/reservoirs
- Nozzles/spray heads
- Flow measurement instruments - venturi and orifice meters, pitot tube, rotameter, anemometer (fan/hot wire)
- Pumps/compressors, motors/turbines
- Actuators - linear (cylinders) and rotary
- Selection of equipment and instruments considering properties and compatibility

T13. Fluid statics

- Pressure at a point, direction of pressure on a surface
- Pressure variation with depth in a liquid

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REQUIRED SKILLS AND KNOWLEDGE

- Pascal's Principle
- Manometer/piezometer calculations (vertical and inclined)
- Forces due to fluid pressure on vertical, horizontal and inclined surfaces
- Centre of pressure
- Archimedes Principle - buoyancy, flotation, apparent weight and centre of buoyancy
- Fluid flow
- Steady and unsteady flow, streamlines and eddies
- Velocity - average or mean and local
- Mass and volume flow rate
- Conservation of mass leading to the Continuity Equation for fluid flow
- Modification of the Continuity Equation for volume flow of liquids or gases with small changes in density
- Bernoulli Equation for ideal fluids, meaning of pressure, velocity and potential head. Total head
- Causes of head loss and modification of the Bernoulli Equation to include a head loss term for real fluids

T14. Fluid power

- Definition and units for work, torque and power
- Relationship between force, velocity and power and torque, angular velocity and power
- Work done by a gas expanding at constant pressure
- Relationship between fluid power, mass flow rate and head
- Relationship between fluid power, volume flow rate and pressure
- Efficiency of a pump or turbine
- Modification of the Bernoulli Equation to include a pump or turbine in the fluid circuit as well as a head loss term

T15. Forces developed by flowing fluids

- Impulse-momentum equation for fluid flow
- Force developed by a jet striking a stationary plate - perpendicular, inclined or curved
- Force developed by a jet striking a moving plate or blade
- Force developed by a jet striking a series of moving plates or blades - power developed and efficiency

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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EVIDENCE GUIDE

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Evaluate fluid and thermodynamic parameters of refrigeration systems as described in 8) and including:

A Determining the extent of the evaluation

B Setting up and conducting appropriate examinations and tests

C Documenting evaluation results for use in design work

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EVIDENCE GUIDE

D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in evaluating fluid and thermodynamic parameters of refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to evaluating and reporting fluid and thermodynamic parameters at least two different types of refrigeration systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ166A Resolve problems in dairy refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers resolving problems in dairy refrigeration systems. It encompasses working safely and to standards, applying knowledge of the components and operation of dairy refrigeration systems, using effective problem resolving techniques and documenting solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage

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Prerequisite Unit(s) **2)**

	refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to resolve problems in dairy refrigeration systems	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
		1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.6	Sources of materials that may be required for the work are accessed in accordance with established procedures.
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Resolve problems in dairy refrigeration systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Problems are approached methodically drawing on operational knowledge of dairy refrigeration systems using observation, measurement, calculations and comparison with normal operating values of system and components.
		2.5	Information needed to resolve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to resolve problems are system specifications, as-installed drawings, maintenance and service records and measured and calculated values of component

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ELEMENT		PERFORMANCE CRITERIA	
			operating parameters.
		2.6	Problems are dealt with safely and with the approval of an authorised person.
		2.7	Problems are resolved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem resolving activities	3.1	OHS risk control work completion measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to resolve problems is documented
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and resolving problems in dairy refrigeration systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ166A **Dairy refrigeration systems**

Evidence shall show an understanding of dairy refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 System characteristics, design features, applications, construction, components and typical layout arrangements.

T2 Operating and control principles

T3 Maintenance schedules

T4 System faults and testing methods

T5 Pure food act and HACCP

T6 Dispensed beverage product knowledge

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably

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gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Resolve problems in dairy refrigeration systems as described in 8) and including:

    A Using methodical problem resolving techniques

    B Accessing relevant information

    C Resolving problems effectively

    D Providing written justification for the solutions used

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in resolving problems in dairy refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in resolving at least three operational problems related to dairy refrigeration systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ167A Resolve problems in central plant air conditioning systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers resolving problems in central plant air conditioning systems. It encompasses working safely and to standards, applying knowledge of the components and operation of central plant systems, using effective problem solving techniques and documenting solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s)

2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **2)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE003B	Solve problems in extra-low voltage single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage

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Prerequisite Unit(s) **2)**

	refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to resolve problems in central plant air conditioning systems	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
		1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.6	Sources of materials that may be required for the work are accessed in accordance with established procedures.
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Resolve problems in central plant air conditioning systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Problems are approached methodically drawing on operational knowledge of central plant air conditioning systems using observation, measurement, calculations and comparison with normal operating values of system and components.
		2.5	Information needed to resolve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to resolve problems are system specifications, as-installed drawings, maintenance and service records and measured and calculated values of component

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ELEMENT		PERFORMANCE CRITERIA	
			operating parameters.
		2.6	Problems are dealt with safely and with the approval of an authorised person.
		2.7	Problems are resolved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem resolving activities	3.1	OHS risk control work completion measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to resolve problems is documented
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and resolving problems in central plant air conditioning systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ167A Central plant air conditioning

Evidence shall show an understanding of central plant air conditioning systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 System characteristics, design features, applications, construction, components and typical layout arrangements.

T2 Operating and control principles

T3 Maintenance schedules

T4 System faults and testing methods

T5 Secondary systems and refrigerants

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs

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and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Resolve problems in central plant air conditioning systems as described in 8) and including:

    A Using methodical problem solving techniques

    B Accessing relevant information

    C Resolving problems effectively

    D Providing written justification for the solutions used

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in resolving problems in central plant air conditioning systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in resolving at least three operational problems related to central plant air conditioning systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ168A Maintain microbial control of refrigeration and air conditioning systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the quality assurance and risk management compliance processes for maintenance of the air and water systems associated with refrigeration and air conditioning. It encompasses working safely and to technical, quality and risk management standards, work specifications and maintenance schedules, sample inspections, evaluating components and completing the necessary maintenance documentation.

Application of the Unit

Application of the Unit **4**)

This unit apply to any qualification in this standard at an AQF 2 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the work place where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Where refrigeration and air conditioning are involved practice in the workplace is subject to Federal/State/Territory regulations covering public health and the relevant codes of practice; in some jurisdictions a licence is required.

Practice in the workplace is also subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

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Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to maintain microbial control of air and water systems.	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
		1.4	The maintenance schedule and process compliance requirements are confirmed and work appropriately sequenced in accordance with established procedures.
		1.5	Appropriate person(s) are consulted to ensure the work is coordinated effectively with others

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ELEMENT		PERFORMANCE CRITERIA	
			involved on the work site.
		1.6	Location equipment to be maintained is determined from maintenance schedule procedures and/or system specifications and diagrams.
		1.7	Resources needed to conduct the maintenance is obtained in accordance with established procedures and checked against job requirements.
		1.8	Tools, equipment and testing devices needed to conduct the maintenance are obtained in accordance with established procedures and checked for correct operation and safety.
2	Maintain microbial control of air and water systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.3	Water samples are taken and tested in accordance with established methods and routines.
		2.4	Apparatus to be maintained is inspected and evaluated for compliance with requirements in accordance with maintenance schedule.
		2.5	Non compliant apparatus/components/samples are documented and arrangements made for their rectification in accordance with established procedures.
		2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.7	Ongoing checks of the quality of the maintenance are undertaken in accordance with established procedures.
		2.8	Maintenance process compliance is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or

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ELEMENT		PERFORMANCE CRITERIA	
			services and using sustainable energy practices.
3	Complete of maintenance processes and documentation.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site and equipment is cleaned and made safe in accordance with established procedures.
		3.3	Final checks are made to verify that the maintenance complies with requirements.
		3.4	Maintenance completion is documented and an appropriate person or persons notified in accordance with established procedures and regulations.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining microbial control of air and water systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ168A Microbial control

Evidence shall show an understanding of microbial control, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Legislation and regulatory requirements for microbial control

T2 Types of air and water systems that require control of harmful microbes.

T3 Harmful microbes and they effects if left uncontrolled

T4 Methods of controlling harmful microbes, including regular cleaning/decontamination of effected plant, sample testing and approved treatment.

T5 Safe handling and application of treatment materials.

T6 Maintenance

- Principles and function
- Systems and terminology
- Data acquisition
  - plant history cards/files
  - inspection techniques
  - predictive maintenance
- Maintenance plans
- Recording methods

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement

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and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria

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shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain microbial control of air and water systems as described in 8) and including:

    A Interpreting maintenance schedule requirements correctly

    B Following quality assurance and risk management compliance processes

    C Following maintenance schedule

    D Sampling water condition

    E Inspecting and evaluating apparatus for quality assurance and risk compliance

    F Arranging for corrective action of non compliant apparatus

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EVIDENCE GUIDE

G Documenting maintenance work.

H Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in maintaining microbial control of air and water systems.

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EVIDENCE GUIDE

Method of assessment	**9**.**4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9**.**5**) There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to maintaining microbial control of at least two different air and water systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers diagnosing, repairing faults and replacing faulty components in refrigeration and air conditioning control systems, components, interconnecting circuits and equipment operating at voltages up to 1000 V a.c. It encompasses working safely, reading circuit diagrams, system diagrams and manufacturers reference material, sketching diagrams from traced wiring, applying logical fault finding procedures, conducting repairs, replacing components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ194A	Solve problems in low voltage

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Prerequisite Unit(s) **2)**

	refrigeration circuits
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE003B	Solve problems in extra-low voltage single path circuits

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to find and rectify faults	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The nature of the fault is obtained from

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ELEMENT		PERFORMANCE CRITERIA	
			documentation and/or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are accessed in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety
2	Find faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live and operating system is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS and regulatory requirements and procedures
		2.4	Fault finding is approached methodically drawing on knowledge of refrigeration and air conditioning control systems using measured and calculated values of system and component parameters.
		2.5	Faults beyond the scope of refrigeration and air conditioning system are identified.
		2.6	Control system components are dismantled where necessary and parts stored to protect them against loss or damage
		2.7	Faulty components are rechecked and their fault status and confirmed.
		2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.

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ELEMENT		PERFORMANCE CRITERIA	
		2.9	Fault finding activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Repair faults	3.1	OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Arrangements are made for appropriately competent and authorised person to rectify faults that are beyond the scope of refrigeration and air conditioning work.
		3.3	Equipment is checked as being isolated where necessary in strict accordance OHS requirements and procedures
		3.4	Materials required to rectify faults are sourced and obtained in accordance with established procedures.
		3.5	Repairs are affected efficiently without damage to other components or apparatus and using sustainable energy principles.
		3.6	Effectiveness of the repair is tested in accordance with established procedures.
		3.7	Apparatus is reassembled, finally tested and prepared for return to customer.
4	Completion and report fault finding and rectification activities	4.1	OHS work completion risk control measures and procedures are followed.
		4.2	Work area is cleaned and made safe in accordance with established procedures.
		4.3	Written justification is made for repairs to circuits/apparatus.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in refrigeration and air conditioning control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ170A Refrigeration and air conditioning systems controls

Evidence shall show an understanding of refrigeration and air conditioning systems safety and cycling controls, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Power and control terminology, symbols and diagrams/drawings

T2 Control systems and components

T3 Refrigeration and air conditioning system electrical/electronic controls

- Types, applications, operation, installation/replacement, setting adjustment and testing
  - Refrigerant pressure sensing controls including low and high pressure, oil pressure controls and defrost pressure controls
  - Temperature, humidity, air/water flow and defrost controls
  - Electrical controls, including timers, relays (starting and control), contactors, three phase motor starters

T4 Refrigeration and air conditioning direct digital controls

- Types, applications, operation, installation/replacement, setting adjustment and testing

T5 Refrigeration and air conditioning pneumatic controls

- Types, applications, operation, installation/replacement, setting adjustment and testing

T6 Refrigeration and air conditioning process characteristics and control parameters

T7 System responses to parameter changes

T8 Finding and rectify control system faults

- Factors to consider in clarifying the nature of a fault including; initial fault report, confirmation of symptoms of the fault, comparison of symptoms with normal

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REQUIRED SKILLS AND KNOWLEDGE

operation

- Effect to cause reasoning — assumptions of possible causes
- Methods for testing assumptions including; visual inspection, sectional testing, split-half tests, component isolation
- Dealing with intermittent faults caused by vibration, shock, changes in temperature and electromagnetic interference.
- Rectifying control system faults including control adjustment, repair and replacement

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material

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carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in refrigeration and air conditioning control systems as described in 8) and including:

    A Using methodical fault finding techniques,

    B Finding faults efficiently,

    C Rectifying faults without damage

    D Providing written justification for the rectifications undertaken

    E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in diagnosing and rectifying faults in refrigeration and air conditioning control systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ110A	Select refrigeration and air conditioning piping, accessories and associated controls

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to diagnose and rectify the following faults in at least two refrigeration and air conditioning control systems.

- Open-circuit
- Short-circuit
- Incorrect connections
- Insulation failure
- Unsafe condition
- Control apparatus/component failure
- Related mechanical failure

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ171A Resolve problems in refrigerated beverage vending cabinets

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers resolving problems in refrigerated beverage vending cabinets. It encompasses working safely and to standards, applying knowledge of the components and operation of refrigerated beverage vending cabinets, using effective problem solving techniques and documenting solutions.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s)

2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE103A Solve problems in ELV voltage single

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Prerequisite Unit(s) **2)**

path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

Or

UEENEEJ155A Service refrigeration appliances

UEENEEJ154A Find and rectify faults in appliance control systems and devices

UEENEEJ162A Recover, pressure test, evacuate, charge and leak test refrigerants appliances

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Prerequisite Unit(s) **2)**

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ195A Establish the basic operating conditions of vapour compression systems - appliances

and

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE103A Solve problems in ELV single path circuits

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Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to resolve problems in refrigerated beverage vending cabinets	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures in preparation for the work are followed
		1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented
		1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken
		1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

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ELEMENT		PERFORMANCE CRITERIA	
			others
		1.6	Sources of materials that may be required for the work are accessed in accordance with established procedures
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Resolve problems in refrigerated beverage vending cabinets	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Problems are approached methodically drawing on operational knowledge of refrigerated beverage vending cabinets using observation, measurement, calculations and comparison with normal operating values of system and components
		2.5	Information needed to resolve problems is gathered and evaluated against normal operating parameters. Note: Examples of information needed to resolve problems are system specifications, as-installed drawings, maintenance and service records and measured and calculated values of component operating parameters.
		2.6	Problems are dealt with safely and with the approval of an authorised person
		2.7	Problems are resolved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy

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ELEMENT		PERFORMANCE CRITERIA	
			practices
3	Complete work and document problem resolving activities	3.1	OHS risk control work completion measures and procedures are followed
		3.2	Work site is cleaned and made safe in accordance with established procedures
		3.3	Justification for solutions used to resolve problems is documented
		3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and resolving problems in refrigerated beverage vending cabinets.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ171A Refrigerated beverage vending cabinets

Evidence shall show an understanding of refrigerated beverage vending cabinets, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Types, construction and operation of refrigerated drink vending cabinets encompassing:

- Coin operated mechanism on the refrigerated vending cabinet.
- Electro-mechanical mechanism on the coin operated vending cabinet.
- Electronic mechanism on the coin operated vending cabinet.

T2 Specialised components and features required for the operation of a coin operated refrigerated vending cabinet encompassing:

- Electrical / electronic control circuitry.
- Air distribution and air flow curtains.
- Lighting arrangements.

T3 Installation requirements for a refrigerated coin operated vending cabinet encompassing:

- Location requirements
- Access requirements and avoidance obstruction
- Power supply and electrical service requirements

T4 System operating conditions for a coin operated refrigerated vending cabinet.

T5 Commissioning, service and maintenance procedures of a refrigerated coin operated vending cabinet encompassing:

- Electrical / electronic control devices checks and adjustments.
- Air flow checks and adjustments.
- Mechanical checks and adjustments
- Typical faults

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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EVIDENCE GUIDE

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Resolve problems in refrigerated beverage vending cabinets as described in 8) and including:

    A Using methodical fault finding techniques,

    B Assessing relevant information

    C Resolving problems effectively

    D Providing written justification for the solutions used

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EVIDENCE GUIDE

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in resolving problems in refrigerated beverage vending cabinets.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in resolving at least three operational problems related to refrigerated beverage vending cabinets.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ172A Recover, pressure test, evacuate, charge and leak test refrigerants - split systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This competency standard unit covers the recovery of refrigerant, pressure and leak testing, evacuation and refrigerant charging in split air conditioning and heat pump systems. It encompasses working safely and to standards, following regulations and industry practices for handling refrigerants and completing the necessary documentation.

Note:
The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 may apply to this competency standard unit. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training and may be used to augment other electrotechnology qualifications at AQF 2 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some States/Territories, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 may apply to this unit. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.
2. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
3. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to recover refrigerants, pressure and leak test, evacuate and charge split systems.	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.
		1.4	The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.5	The work is appropriately sequenced in accordance with job schedule.
		1.6	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved

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ELEMENT		PERFORMANCE CRITERIA	
			on the work site.
		1.7	Refrigerants, lubricants and cleaning materials needed for the work are obtained in accordance with established procedures and checked against job requirements
		1.8	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
		1.9	Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2	Recover refrigerants, pressure and leak test, evacuate and charge split systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	Checks are carried out to ensure the system or component parts are isolated, when necessary, in strict accordance with OHS requirements and procedures
		2.3	Machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures and circuits are isolated and confirmed by appropriately competent personnel
		2.4	Refrigerants are removed from a split system safely into suitably labelled containers in accordance with regulatory requirements and industry practices, and any electrical work is referred to an appropriate licensed person
		2.5	Precautions are taken to prevent damage to components while pressure testing the system
		2.6	Pressure testing is conducted using dry nitrogen at a pressure relative to the refrigerant to be used
		2.7	Leaks are located and rectified using testing methods appropriate to the system under test and in accordance with industry practices
		2.8	Split system is evacuated to the required level and cleaned the system of all moisture and other containments in accordance with industry practices

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ELEMENT		PERFORMANCE CRITERIA	
		2.9	A 'Drop test' is used to prove effectiveness of the evacuation in accordance with industry practice using an appropriate electronic vacuum gauge
		2.10	Components lubricants are checked and maintained in accordance with manufacturer's requirements
		2.11	Split systems are charged with the appropriate refrigerant in accordance with manufacturer's requirements and industry practices
		2.12	Problematic situations that arise during the work are dealt with in an appropriate manner
		2.13	Split systems are pressure and leak tested, evacuated and charged efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices
3	Complete and report refrigerants recovery, pressure and leak test and evacuate and charge work	3.1	OHS risk control work completion measures and procedures are followed
		3.2	Work site is cleaned and made safe in accordance with established procedures
		3.3	Contaminated refrigerant is dealt with in accordance with legislative/regulatory requirements
		3.4	Completion of the work is documented and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and recovering, pressure and leak testing, evacuating and charging refrigerants split systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ172A Split system basic operating principles, refrigerants and lubricants

Evidence shall show an understanding of refrigerants and lubricants used in split air conditioning and heat pump systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated

T1 The Residential Air Conditioning and Heat Pump Industry and Licensing Requirements

- Brief overview and history of the Australian residential air conditioning/heat pump industry
- Typical applications and equipment
- Overview of the State and federal agencies (environment and heritage, greenhouse office, ARC, OFT etc)
- State and federal licensing requirements
- The ozone protection act
- The ozone layer (function, ozone depleting substances)
- Overview of the Australia and New Zealand refrigerant handling code of practice 2007, Part 2, Systems other than Self-contained low charge systems

T2 Heat

- Matter (atoms, molecules, energy and its different forms)
- Heat energy (definition, unit of measurement)
- Enthalpy (definition, unit of measurement)
- Heat flow (hot to cold)
- Heat transfer
  - methods (conduction, convection, radiation)
  - requirements
  - effects

T3 Temperature and Relative Humidity

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REQUIRED SKILLS AND KNOWLEDGE

- Temperature
- Scale types (imperial, metric, absolute) and their units of measurement
- Conversion to/from absolute values
- Temperature difference/change (td, Δt, unit of measurement)
- Relative humidity

T4 Sensible and Latent Heat

- Definition of specific heat capacity, latent heat and sensible heat (including units of measurement)
- Types of latent heat
- Heat calculations

T5 Pressure

- Define
- Scale types (imperial, metric, absolute) and their units of measurement
- Vacuum scales (Pascals, microns)
- Conversion to/from absolute values
- The basic Gas Laws – Boyles, Charles and Daltons (excl combined or general gas law)
- Pressure gauge types and applications (pressure, compound, vacuum, manometer, magnehelic, barometer)
- Hazards and related safe working practices (dangerous system pressures)
- Care and maintenance (ingress of oil and contaminants (dirt), avoiding needle bounce (especially HP) etc)
- Calibration (atmospheric pressure, send to a specialist etc)
- Appropriate and safe methods of use
- Typical locations

T6 Refrigerant conditions

- Saturation temperature
- Saturated liquid / saturated vapour
- Superheated vapour
- Sub-cooled liquid
- Pressure temperature relationships
- P/T charts
- Enthalpy

T7 The Vapour Compression Cycle

- Major system components
- High and low pressure sides
- Basic system operation

T8 Thermometers and relative humidity devices

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REQUIRED SKILLS AND KNOWLEDGE

- Thermometer types and applications (digital, stem, dial, max/min, non-contact, data loggers)
- Relative Humidity measurement devices and applications (dry bulb/wet bulb, sling, digital)
- Hazards and related safe working practices (working near rotating machinery - fans, pulleys, belts etc)
- Care and maintenance (bending stems, overheating, removing batteries after use, uncoiling capillary)
- Calibration (boiling water, iced water, send to a specialist etc)
- Appropriate and safe methods of use
- Typical locations on a system
- Fitting temperature and relative humidity instruments

T9 Leak Detectors

- Detector types and applications (electronic, halide, bubble, ultra violet)
- Hazards and related safe working practices (working around rotating machinery, open flame, ultra violet light etc)
- Care and maintenance (delicate electronic equipment, changing sensor tip filters, changing gas cartridges etc)
- Calibration (auto calibrating , send to a specialist etc)
- Leak detection procedures

T10 Service Gauges

Manifold Gauges

- Types (dial gauges or electronic, manifolds with additional vacuum and charging ports & sight glasses)
- Typical uses for service gauges (high & low side pressure readings, charging, evacuating)
- Care and maintenance (oil and contaminants (dirt) in hoses, avoiding needle bounce, changing hose seals)
- Calibration (hoses open to atmosphere, adjusting screw etc)
- Hose shut-off valves and adaptors (access control valves, kwik couplers, etc)

System Access Fittings

- Types (Schrader, service valve, post valve, quick couplers etc)
- Typical applications for each
- Hazards and related safe working practices (oil or liquid spray, keeping clean, leaks etc)
- Care and maintenance (gland nuts loosened/tightened, seal caps fitted, regulations on piercing valves)

Using Service Gauges

- Service gauge manifold hose fitting

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REQUIRED SKILLS AND KNOWLEDGE

- Purging
- Pressure readings
- Service gauge manifold hose removal
- Pressure to temperature conversion

T11 Properties of Split Heat Pump Refrigerants

- Types (R22, R407C, R410a, R12 (old units) Hydrocarbons)
- Terms (blend, azeotrope, zeotrope, glide, CFC, HCFC, HFC, HC, bubble point, dew point, critical point, ODP, GWP etc)
- Typical properties of the current refrigerants used in split systems (boiling point, glide, composition (components), comparative latent heat performance etc)

T12 Properties of Split Heat Pump Refrigerant Oils

- Types (mineral, POE, AB) and their applications
- Basic properties (miscibility, dielectric strength and viscosity)
- Typical issues regarding compatibility (neoprene and POE, POE and mineral etc)
- Safe handling (MSDS - POE's, Mineral, AB's - Residual acid's in used oil)

T13 Procedures for Working with Refrigerants

- Contaminants (Non-condensables, moisture, carbon, copper etc), effects of contamination (Acid, motor burnout, oil contamination, seizing, RMD blockage etc) and methods of contamination prevention
- Reclaiming/recovering refrigerants (using recovery pumps)
- Recovery cylinders (suitable types, markings and precautions – Code of Practice)
- Disposing of recovered refrigerants (Code of Practice)
- Pressure testing systems (suitable gases (nitrogen), test pressure etc)
- Purging pipework (illegal in Australia)
- Evacuation of newly installed split systems (vacuum pumps, correct use, 'drop testing')
- Charging refrigerant into a newly installed split system (pre-charged, charging cylinders, electronic scales)
- Detecting refrigerant leaks (electronic, bubbles, halide for R22)
- De-commissioning a split system (recovering refrigerant, isolating in outdoor unit)
- The practice of retrofitting (overview)
- Working with high pressure refrigerants (R410A) and Hydrocarbons (special precautions, tools etc)

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

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EVIDENCE GUIDE

competency in this unit

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Determine the basic operating conditions, recover, pressure and leak test, evacuate and charge refrigerants split systems as described in 8) and including:

A Selecting and using appropriate measuring devices, materials and equipment correctly

B Recording measurements

C Using calculation methods accurately

D Identifying the conditions of a refrigerant at various locations in the vapour compression system

E Documenting operating conditions correctly

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EVIDENCE GUIDE

F Removing and storing refrigerant correctly

G Conducting pressure testing at the appropriate pressure level and without damaging components

H Locating and rectifying leaks

I Evacuating the system to the required standard and using appropriate vacuum measuring instruments

J Charging the system with the appropriate refrigerant

K Completing the necessary documentation

L Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in recovering, pressure and leak testing, evacuating and charging refrigerants split systems.

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EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to testing and charging split systems encompassing the following:

- Determining operating conditions using measurement and basic calculation methods of vapour compression split systems whether used for refrigeration or air conditioning. These conditions include suction and discharge pressures, ambient, evaporator and condensing temperatures, evaporator, and condenser temperature difference.
- Recovering refrigerant from an existing split system including split single head air conditioning and hot water heat pump systems
- Pressure and leak testing a newly installed systems
- Evacuating newly installed systems in preparation for charging with refrigerant
- Charging newly installed systems with refrigerant

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ173A Service and repair microwave ovens

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers maintaining the effective and efficient operation of microwave ovens. It encompasses working safely, applying knowledge of microwave ovens, following service manuals, testing appliance function, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where appliances are connected to fixed wiring at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for servicing electrical appliance. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ154A Find and rectify faults in appliance control systems and devices

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

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Prerequisite Unit(s) **2)**

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE103A Solve problems in ELV single path circuits

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to service microwave ovens.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed
		1.3	The extent of work to be undertaken is determined from service/fault request and/or discussions with appropriate person(s)
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others
		1.5	Sources of materials/parts that may be required for the work are established in accordance with established procedures
		1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established

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ELEMENT		PERFORMANCE CRITERIA	
			procedures and checked for correct operation and safety
2	Service microwave ovens	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Appliance is checked as being correctly isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Safety hazards resulting from the defect or fault are documented and risk control measures devised and implemented in consultation with appropriate personnel
		2.5	Appliances are tested for efficient operation and components affecting efficiency are inspected for wear or defects in accordance with standards, manufacturer service manuals and industry codes of practice
		2.6	Appliance faults and their cause are identified through the application of refrigerated appliances and using measured and calculated values of appliance parameters
		2.7	Appliance is dismantled where necessary and parts stored to protect them against loss or damage
		2.8	Defective, worn or faulty appliance components are rechecked and their status confirmed
		2.9	Replacement parts required to rectify defects/faults are sourced and obtained in accordance with established procedures
		2.10	Effectiveness of the repair is tested in accordance with established procedures
		2.11	Apparatus is reassembled, finally tested and prepared for return to service

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ELEMENT		PERFORMANCE CRITERIA	
		2.12	Unexpected situations are dealt with safely and with the approval of an authorised person
		2.13	Servicing activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices
3	Completion and report fault finding and repair activities.	3.1	OHS risk control work completion measures and procedures are followed
		3.2	Work site is cleaned and made safe in accordance with established procedures
		3.3	Service report is completed and verified by an appropriate person in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and servicing microwave ovens.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ173A Microwave ovens

Evidence shall show an understanding of microwave ovens, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Microwave cooking basics encompassing:

- Properties of microwaves
- Biological effects of microwaves
- Fundamental microwave oven operations

T2 Microwave oven performance encompassing:

- Radiation leakage
- Power output measurement
- Oven leakage safety system
- Magnetron tests and measurements
- Interlocks
- Thermal cut outs and thermostats
- Stirrer cooling and turntable systems

T3 Power control systems encompassing:

- Hazards of microwaves and associated high voltages
- High/low power selection
- Duty cycle control systems
- Basic circuit diagrams
- New microwave oven technology such as inverter microwave ovens

T4 Auto-cook facilities encompassing:

- Temperature control cooking systems
- Humidity sensor cooking systems
- Infrared sensor cooking systems
- Convection microwave oven systems

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REQUIRED SKILLS AND KNOWLEDGE

T5 Service, fault finding and repair encompassing:

- Manufacturers' data
- Safety checks
- Operating sequence
- Typical fault symptoms
- Test equipment
- Fault identification
- Fault location using test equipment and service manuals
- Repairs techniques

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Service microwave ovens as described in 8) and including:

A Determining the nature of the work from service request

B Identifying defective components affecting appliance efficiency

C Finding faults efficiently

D Rectifying defects/faults effectively

E Testing appliance functions effectively

F Completing service report accurately

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing microwave ovens.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to servicing microwave ovens with any four of the following defects/faults in electric heating systems in each of two different types of appliance:

- Higher energy use than previously experienced
- Not cold enough.
- Appliance light not working.
- Electric shock received from appliance cabinet.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) Descriptor

This unit covers the safety and legal requirements to handle, use and store hydrocarbon refrigerants. All safety aspects are covered to Australian and International standards. Legal requirements are covered at local, State&National level.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and

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Application of the Unit **4**)

safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is to regulations directly relating to all OHS and AS requirements.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

There are no prerequisite competencies for this unit.

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work with hydrocarbon refrigerants	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Work area access permits are obtained from appropriate personnel according to established procedures.
	1.3	Preparations for electrical and non-electrical isolation are carried out to prevent creation of hazards from loss of machine/system/process control according to established procedures.
	1.4	Tools and equipment needed for the work are checked for safety and correct functionality according to established procedures and regulatory requirements.

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ELEMENT	PERFORMANCE CRITERIA	
2 Apply safe working practices to hydrocarbon refrigerants	2.1	Workplace procedures and work instructions for controlling risk are followed accurately.
	2.2	Workplace procedures for dealing with accidents, fires and emergencies are followed according to work procedures and scope of responsibility and competencies.
3 Follow workplace procedures for hazard identification and risk control of hydrocarbon refrigerants	3.1	Hazards are identified and control measures implemented and monitored through active participation in the consultation process with employer and other employees.
	3.2	Hazards in the work area are recognised and reported to appropriate personnel according to established procedures.
	3.3	OHS records of incidents are completed in accordance with regulatory requirements and established procedures.
	3.4	Workplace instructions and training are followed accurately within established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and applying OHS practices in relation to hydrocarbon refrigerants.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ174A Safe working practices for hydrocarbon refrigerants

Evidence shall show an understanding of safe working practices and relevant Standards, Codes and Regulations for hydrocarbon refrigerants to an extent indicated by the following aspects:

T1 Environmental issues

- Ultraviolet light and the Ozone Layer
- The Greenhouse Effect and Global Warming
- Refrigerant categories and basic compositions
- Environmental issues for each category

T2 Hydrocarbon Types and applications

- Introduction to hydrocarbons as a refrigerant
- Types
- Applications
- Properties
- Compatibility

T3 Acts, Regulations and Standards

- OH&S Overview
- Purpose of Acts, Regulations, Codes of Practice, Standards & guidelines
- Duty of care
- Applicable acts, standards and codes
- Record keeping requirements
- Toxicity and flammability groupings

T4 Emergency Procedures & Incident Management

- Workcover
- Hazard Control and Risk Assessment
- Typical emergency response plans

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REQUIRED SKILLS AND KNOWLEDGE

T5 First Aid

- Personal protective equipment
- Hydrocarbon exposure
- Asphyxiation and revival techniques

T6 MSDS and HAZCHEM codes

- Types and layout
- Reading MSD sheets
- HAZCHEM codes

T7 Cylinders and Storage

- Ignition sources
- Storage requirements for hydrocarbons
- Typical plant room layouts and requirements
- Maintenance procedures
- Cylinder and system labelling
- Disposal of hydrocarbon refrigerants and lubricating oils

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package..

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace.

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EVIDENCE GUIDE

However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

A. Preparing to enter the workplace including, the use of work permits and clearances and isolation permissions.

B. Applying work procedures and instructions as they apply to risk control measures.

C. Dealing with accidents and emergencies within the scope of responsibility.

D. Participation in consultation processes, identifying hazards and implementing and monitoring control measures.

E. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

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EVIDENCE GUIDE

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above, evidence should show demonstrated competency in applying specific hydrocarbon OHS practices in the workplace.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

This unit shall be assessed concurrently, as it relates to other units undertaken in a possible skill clusters or qualification.

Components of this unit are included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

a) Relevant Occupational Health and Safety legislation, regulations and codes of practice related to hazards presented by the use of hydrocarbon refrigerants in refrigeration and air conditioning systems.
b) Accepted industry work procedures and the specific safety procedures and work instructions related to working with refrigeration and air conditioning systems containing a hydrocarbon refrigerant

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	3

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ175A Service and repair self contained hydrocarbon air conditioning and refrigeration systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers specialised procedures for servicing and repairs to achieve the effective and efficient operation of primarily self contained air conditioning and refrigeration equipment using Hydrocarbon as the refrigerant. It reinforces safe working practice and encompasses applying specialised knowledge of refrigeration principles that apply to Hydrocarbon, following service manuals, testing, locating and rectifying faults and defective components and completing the necessary service documentation.

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Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting,

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risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note.
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

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Prerequisite Unit(s)	**2)**
-	Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants and UEENEEJ155A Service refrigeration appliances UEENEEJ054B Find and rectify faults in appliance motors and associated controls UEENEEJ062B Find and rectify faults in appliance motors and associated controls UEENEEJ102A Prepare and connect refrigerant tubing and fittings UEENEEJ195A Establish the basic operating conditions of vapour compression systems - appliances and UEENEEG006A Solve problems in single and three phase low voltage machines UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace UEENEEE102A Fabricate, assemble and dismantle utilities industry components UEENEEE104A Solve problems in d.c. circuits UEENEEE105A Fix and secure electrotechnology equipment UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications UEENEEG101A Solve problems in electromagnetic devices and related circuits UEENEEG102A Solve problems in low voltage a.c. circuits UEENEEG106A Terminate cables, cords and accessories for low voltage circuits or UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

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Prerequisite Unit(s)

2)

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE103A Solve problems in ELV single path circuits

or

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE103A Solve problems in ELV single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration

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Prerequisite Unit(s) **2)**

systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

Note:

UEENEEJ111A - Those holding a 'Certificate III in Refrigeration and Air Conditioning trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

UEENEEJ155A - Those holding a 'Certificate III in Appliance Servicing trade qualification or equivalent" meet the requirements of this unit and its pre-requisite requirements.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to service and repair Hydrocarbon refrigeration and air conditioning systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature of work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Service and repair Hydrocarbon refrigeration and air conditioning systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Measuring system operating parameters is

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ELEMENT	PERFORMANCE CRITERIA	
		conducted in strict accordance with OHS requirements and established safety procedures
	2.3	Checks are carried out to ensure the system or component parts are isolated, when necessary in strict accordance OHS requirements and procedures.
	2.4	Refrigerant is removed from a system safely in accordance with regulatory requirements and industry practices.
	2.5	Precautions are taken to prevent damage to components while pressure testing the system
	2.6	Pressure testing is conducted at a pressure compatible with Hydrocarbon and in accordance with standards
	2.7	Leaks are located and rectified using testing methods appropriate to the system and in accordance with industry practices
	2.8	Oil is removed from an operational Hydrocarbon system in accordance with industry practices
	2.9	System is charged safely with Hydrocarbon and compatible lubricants in accordance with industry practices
	2.10	Established procedures are used to determine actual and specified range of operating conditions from measured and calculated values as they apply to Hydrocarbon vapour compression systems.
	2.11	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.13	Operating conditions are determined without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and report on servicing and repairing Hydrocarbon refrigeration and air conditioning systems	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Contaminated refrigerant and lubricant is dealt with in accordance with legislative/regulatory requirements
	3.4	Operation conditions are documented, including identification of any parameter that is not within the specified range for the system.
	3.5	Work supervisor is notified of the completion of the work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and determining the operating conditions of Hydrocarbon refrigerating systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ175A Self contained Hydrocarbon refrigeration and air conditioning systems

Evidence shall show an understanding of servicing and repair techniques, applying safe working practices and relevant Standards, Codes and Regulations for Hydrocarbon refrigeration systems to an extent indicated by the following aspects:

T1 Hydrocarbon refrigeration systems

- Basic operation system types, applications and design operating conditions
  - Domestic refrigerators
  - Self contained refrigeration cabinets
  - Self contained air conditioners
  - Single head split air conditioners
  - Heat pump water heaters

T2 Operating conditions for hydrocarbon refrigeration systems

- Compressors
  - Functions of the compressor
  - Types, construction and their applications
- Lubrication and lubricators
  - Lubrication methods
  - Safe handling of lubricants
  - Selection of Lubricants
  - Adding and removing oil from Hydrocarbon systems
- Evaporators / Cooling Units
  - Types, construction and applications
  - Evaporator defrost methods and controls
  - Operation and maintenance
- Refrigerant Flow Devices
  - Types, construction and applications

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REQUIRED SKILLS AND KNOWLEDGE

- Operation and maintenance
- Ancillary Components
  - Leak detectors
  - Safety controls
  - Operation and maintenance

T3 Applicable Standards and Codes

- Hazards associated with Hydrocarbons
- AS/NZS 1677
- AS/NZS 1571
- IIAR Bulletins
- ANSI/ASHRAE Standards
- International Standards EN378

T4 System access tools

- Schraeder valves
- Piercing valves
- Process tube adaptors
- Gauge manifold sets
- Maintenance

T5 Access procedures

- Ignition sources
- Ventilation
- Gauge manifold hoses
- System operating values

T6 Refrigerant removal/recovery and flushing

- Bleed to atmosphere
- Recovery to a cylinder
- Burning
- Flush with inert gas

T7 Tube joining methods

- Lok-ring
- Flare joints
- Silver brazed joints
- Flux

T8 Compressor lubricants

- Types
- Properties
- Replacing

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REQUIRED SKILLS AND KNOWLEDGE

- Disposing

T9 Pressure testing

- Requirements
- Recommended pressures

T10 Evacuation

- Vacuum pumps
- Vacuum measuring devices
- Maintenance
- Recommended depth of vacuum
- Procedure

T11 Charging

- Precautions
- Liquid or vapour charging
- Suitable methods
- Disposing of contaminated refrigerant and oil

T12 Leak detection

- Methods
- Procedure
- Maintenance

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or

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EVIDENCE GUIDE

final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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Critical aspects of evidence required to demonstrate competency in this

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Pressure testing, charging/discharging refrigerant/lubricants and determining the operating conditions of self contained Hydrocarbon vapour compression systems.

    A Selecting appropriate materials and equipment

    B Obtaining and recording measurements

    C Removing and storing refrigerant correctly

    D Conducting pressure testing at the appropriate pressure level and without damaging components

    E Locating and rectifying leaks

    F Evacuating the system to the required standard and using appropriate vacuum measuring instruments

    G Charging the system with the appropriate type and quantity of hydrocarbon refrigerant

    H Completing the necessary documentation

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Critical aspects of evidence required to demonstrate competency in this

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing and repairing as well as determining the operating conditions of Hydrocarbon systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

There are no concurrent assessment recommendations for this unit.

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Critical aspects of evidence required to demonstrate competency in this other units

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining operating conditions, using measurement and basic calculation methods, of primarily self contained Hydrocarbon refrigeration and air conditioning systems.

These systems are confined to those used in the following two Categories of Occupancy described in the Standard EN378-1 Refrigerating systems and heat pumps - Safety and environmental requirements - Part 1: Basic requirements, definitions, classification and selection criteria:

A General Occupancy

B Supervised Occupancy

These systems include domestic refrigerators and freezers; self contained refrigerated cabinets; self contained air conditioning units; single head split air conditioning units; and self contained heat pump water heaters.

It does NOT include systems described in category C Authorised Occupancy. This includes refrigeration and air conditioning equipment installed in plant rooms.

These conditions include suction and discharge pressures, ambient, evaporator and condensing temperatures, evaporator, and condenser temperature difference. Further, this unit must be demonstrated in relation to refrigerant recovery, component replacement, pressure testing, evacuation, charging and leak testing a hydrocarbon system in a safe and environmentally responsible manner.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ176A Install and commission hydrocarbon refrigeration systems, components and associated equipment

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers specialised procedures for the installation and commissioning of refrigeration equipment using Hydrocarbon as the refrigerant. It encompasses working safely and to installation standards matching equipment, location, components and piping to given specifications. After installation, to commission the complete system including: pre commissioning tests, starting the system, ensuring correct refrigerant charge, basic air or water balancing, adjusting components and controls to efficient operation. Completing all necessary installation and commissioning documentation.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that

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Application of the Unit

4)

all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants

UEENEEJ175A Service and repair self contained hydrocarbon air conditioning and refrigeration systems

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

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Prerequisite Unit(s) **2)**

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE103A Solve problems in ELV single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

and

UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants

and

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Prerequisite Unit(s) **2)**

UEENEEJ155A Service refrigeration appliances

UEENEEJ054B Find and rectify faults in appliance motors and associated controls

UEENEEJ062B Find and rectify faults in appliance motors and associated controls

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ195A Establish the basic operating conditions of vapour compression systems - appliances

and

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety

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Prerequisite Unit(s)

2)

regulations, codes and practices in the workplace

UEENEEE103A Solve problems in ELV single path circuits

or

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE103A Solve problems in ELV single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

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Prerequisite Unit(s)

2)

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

Note:

UEENEEJ113A - Those holding a 'Certificate III in Refrigeration and Air Conditioning trade qualification or equivalent" meet the requirements of these units and their pre-requisite requirements.

Employability Skills Information

Employability Skills

3)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance must be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and commission Hydrocarbon refrigeration systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	OHS procedures for a given work area are identified, obtained and understood
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented
	1.4	The nature and location of work is determined from documentation or appropriate person(s) to establish the scope of work to be undertaken
	1.5	Component, equipment installation and commissioning work is appropriately sequenced in accordance with job schedule
	1.6	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.7	Materials needed to install pipework are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to install and commission the components and equipment are obtained in accordance with established procedures and checked for correct operation and safety
	1.9	System control setting and operating parameters are determined from job specifications and requirements
	1.10	Preparatory work is scheduled to ensure no damage has occurred and complies with requirements

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ELEMENT	PERFORMANCE CRITERIA	
2 Install Hydrocarbon refrigeration systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance with OHS requirements and procedures
	2.3	Components and equipment are installed to comply with technical standards, job specifications and requirements with sufficient access to affect electrical and pipework connections and maintenance
	2.4	Components and equipment are installed straight and square in the required locations and within acceptable tolerances
	2.5	Refrigerant tubing and fittings are silver brazed with the use of dry nitrogen to prevent contamination
	2.6	Problematic situations that arise from the installation of components and equipment are dealt with in an appropriate manner
	2.7	Ongoing checks of the quality of pipework are undertaken, including pressure testing and repair of leaks in accordance with the relevant technical standards and specifications and established procedures
	2.8	Components and equipment are installed efficiently without waste of materials or damage/contamination to apparatus and the surrounding environment or services and using sustainable energy practices
3 Commission Hydrocarbon systems	3.1	Refrigeration system pressure controls, valves and regulators are adjusted to their required settings
	3.2	Testing/measuring devices are used to observe the operation of the refrigeration system and fine adjustments of controls are made as necessary
	3.3	Unexpected situations are dealt with safely and

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ELEMENT	PERFORMANCE CRITERIA	
		with the approval of an authorised person
	3.4	Commissioning is conducted efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices
4 Complete installation and commissioning work	4.1	OHS work completion risk control measures and procedures are followed.
	4.2	Work site is cleaned and made safe in accordance with established procedures.
	4.3	Final check of the installed components and equipment is made to verify that it complies to all requirements
	4.4	'As installed' components and equipment is documented and an appropriate person or persons notified in accordance with established procedures
	4.5	Results of commissioning are documented including final operating parameters and an appropriate person or persons notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and commissioning refrigeration systems and associated equipment to be charged with a hydrocarbon refrigerant.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ176A Installation and commissioning techniques for Hydrocarbon refrigeration Systems

Evidence shall show an understanding of installation and commissioning techniques for hydrocarbon refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Special features for hydrocarbon system

- Compatibility Issues
  - Major components
  - Materials/substances
  - Metering devices
  - Regulating valves
  - Electrical controls
  - Tools
- Refrigerant leakage
- Enclosures

T2 Codes, regulations and standards

- EN378
- AS 1677.1
- ANZ Refrigerant Handling Code of Practice 2007- Part 1

T3 Site Arrangements

- Building services
- Piping requirements for hydrocarbons
- Suitable Equipment locations

T4 Site Safety

- Hazards
- Checklist

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REQUIRED SKILLS AND KNOWLEDGE

- Report

T5 System diagrams

- Mechanical layouts
- Electrical circuits

T6 Installation

- Assembly
- Pressure Testing
- Evacuation
- Charging
- Leak Detecting

T7 Commissioning

- Pressure Temperature relationships for hydrocarbon refrigerants
- Evaporator Td's for hydrocarbon systems
- Condenser Td's for hydrocarbon systems
- Cycling control settings
- Safety control settings
- Regulator settings
- Refrigerant metering device settings

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum,

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EVIDENCE GUIDE

the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Pressure testing, charging/discharging refrigerant/lubricants and determining the operating conditions of Hydrocarbon vapour compression and liquid recirculation refrigeration system. as described in 8) and including:

    A Reading and interpreting drawings to pipe work layouts and apparatus locations.

    B Installing, connecting , securing and aligning components and equipment and ensuring that all equipment and pipe work is compliant with codes and regulations

    C Pressure testing entire system at the appropriate design test pressures using dry nitrogen

    D Removing system contaminants and evacuating

    E Selecting and using appropriate measuring devices correctly

    F Recording measurements

    G Using calculation methods accurately

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EVIDENCE GUIDE

H Discharging / charging refrigerant / lubricants and pressure testing the system without damage to components

I Locating and rectifying leaks

J Using methodical and efficient commissioning techniques

K Optimizing system performance and efficiency

L Identifying the conditions of the refrigerant at various locations in the vapour compression and liquid recirculation system.

M Completing the necessary installation and commissioning reports and documentation

N Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to servicing and repairing as well as determining the operating conditions of Hydrocarbon vapour compression and liquid recirculation systems.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to installing and commissioning the major components and associated equipment for at least 2 different types of refrigeration and/or air conditioning systems operating with a hydrocarbon refrigerant.

Major components shall include refrigeration compressors, condensers, condensing units and evaporators.

Associated equipment shall include refrigerant flow controls, cycling controls, safety controls, on-site leak detection equipment, ventilation systems, spark isolation systems and electrical isolation, monitoring and inspection accessories.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ177A Design hydrocarbon refrigerated systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of refrigeration systems using Hydrocarbon as a refrigerant. It encompasses applying knowledge of complex refrigeration systems, safety and regulatory requirements, developing alternative design schemes based on a design brief and customer requirements and documenting system design.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

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Application of the Unit **4**)

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practise in the work place. However practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the characteristics and behaviour of material in an engineering environment.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

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Prerequisite Unit(s) **2)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ132A Design commercial refrigeration systems and select components

UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants

UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications

UEENEEJ165A Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE103A Solve problems in ELV single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions

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Prerequisite Unit(s)

2)

of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance must be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design Hydrocarbon refrigeration systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent and nature of the refrigeration system is determined from design specifications.
	1.3	Safety and other regulatory requirements to which the system shall comply are identified, obtained and understood.
	1.4	Work supervisor or customers are consulted to determine which functions of the system are to be used and the parameter of each and written confirmation sought.
	1.5	Design development work is planned to meet scheduled timelines in consultation with others

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ELEMENT	PERFORMANCE CRITERIA	
		involved on the work site.
2 Design Hydrocarbon refrigeration systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of Hydrocarbon refrigeration system analysis, Hydrocarbon refrigeration system components and piping, performance standards and compliance methods are applied to developing the system design.
	2.3	Safety, functional and budgetary considerations are incorporated in the installation designed.
	2.4	Equipment required for the system is selected in accordance with the design specifications and established requirements.
	2.5	Location of components of the system is documented to ensure correct operation of system functions.
	2.6	System design draft is checked for compliance with the design brief and regulatory requirements.
	2.7	System design is documented for submission to appropriate person(s) for approval.
	2.8	Solutions to unplanned situation are provided consistent with organisation's policy.
3 Obtain approval for engineering computer applications design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing hydrocarbon refrigerating systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ177A Hydrocarbon refrigeration systems design

Evidence shall show an understanding Hydrocarbon refrigeration systems, components and piping design requirements, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Technical standards, regulations and codes for hydrocarbon refrigeration systems

- Standard philosophy and format
- Standards, regulations and codes that apply to Hydrocarbon refrigeration systems
- Equipment manufactures specifications

T2 Hydrocarbon refrigeration system design requirements

- Applications of hydrocarbon refrigeration systems
  - Domestic refrigerators
  - Commercial refrigeration
- Thermodynamic properties of HC
  - HC phase diagram
  - HC properties tables and chart
- HC Refrigeration cycle
  - P-h diagram representation
  - Expansion, evaporation, compression and condensation processes
- Performance analysis of HC refrigeration systems
  - Refrigerating effect
  - Heat of rejection
  - Heat of compression
  - Coefficient of performance
  - Effects of suction superheating on cycle efficiency

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REQUIRED SKILLS AND KNOWLEDGE

- Effects of liquid sub-cooling on cycle efficiency
- Actual HC refrigeration cycles
  - Superheating inside and outside the refrigerated space
  - Liquid-suction heat exchangers
  - Pressure drop in piping due to friction and dynamic losses

T3 Hydrocarbon refrigeration system components and piping

- Design preliminaries
  - System operating parameters
  - Project specifications
  - Equipment selection criteria
  - Selection tables, charts and catalogues
- Materials used with HC refrigerants
- Heat exchanger selection
  - Selection of evaporators
  - Selection of condensers
- Compressor selection
- Liquid expansion devices selection
- System load balance point
- Refrigeration line design and sizing
- Automatic controls
- Safety
  - MSDS of HC refrigerants

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1**) Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over

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EVIDENCE GUIDE

time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design Hydrocarbon refrigeration systems as described in 8) and including:

    A Understanding required operating functions and parameters from the design specification

    B Developing the design within the safety, regulatory and functional requirements and budget limitations

    C Documenting and presenting design effectively

    D Successfully negotiating design alteration requests

    E Obtaining approval for final design

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing Hydrocarbon refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different hydrocarbon refrigeration systems encompassing only one of each major component (i.e. condenser, compressor and evaporator), associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ178A Apply safety awareness and legal requirements for ammonia refrigerant

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the safety and legal requirements to handle, use and store Ammonia refrigerant. All safety aspects are covered to Australian and International standards. Legal requirements are covered at local, State&National level.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also

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Application of the Unit **4**)

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is to regulations directly relating to all OH&S and AS requirements.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

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Prerequisite Unit(s) **2)**

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work with Ammonia refrigerant	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Work area access permits are obtained from appropriate personnel according to established procedures.
	1.3	Preparations for electrical and non-electrical isolation are carried out to prevent creation of hazards from loss of machine/system/process control according to established procedures.

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Tools and equipment needed for the work are checked for safety and correct functionality according to established procedures and regulatory requirements.
2	Apply safe working practices to Ammonia refrigerant	2.1	Workplace procedures and work instructions for controlling risk are followed accurately.
		2.2	Workplace procedures for dealing with accidents, fires and emergencies are followed according to work procedures and scope of responsibility and competencies.
3	Follow workplace procedures for hazard identification and risk control of Ammonia refrigerant	3.1	Hazards are identified and control measures implemented and monitored through active participation in the consultation process with employer and other employees.
		3.2	Hazards in the work area are recognised and reported to appropriate personnel according to established procedures.
		3.3	OHS records of incidents are completed in accordance with regulatory requirements and established procedures.
		3.4	Workplace instructions and training are followed accurately within established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and determining the operating conditions of both vapour compression and liquid recirculating ammonia refrigerating systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ178A Safe working practices with Ammonia refrigerant

Evidence shall show an understanding of safe working practices and relevant Standards, Codes and Regulations for Ammonia refrigerant an extent indicated by the following aspects:

T1 Introduction to Ammonia Refrigerant

- Properties of Ammonia
- Occupational Health and Safety Legislation
- Physical Effects of Ammonia
- Flammability of Ammonia

T2 Australia Standards

- AS/NZS 1667.1:1998 Refrigerating Systems Refrigerant Classification
- AS/NZS 1667.2:1998 Refrigerating Systems Safety Requirements for Fixed Applications
- AS/NZS 2022: 2003 Anhydrous Ammonia – Storage and Handling

T3 Safety

- Hazards in a refrigeration plant
- Hazards of Ammonia
- Dealing with emergencies
- Personal Protection Equipment
- Draining oil procedure
- Ammonia decanting procedure
- Ammonia charging procedure
- Ammonia pump down procedure
- Ammonia purging procedure
- Confined spaces
- First aid for Ammonia

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REQUIRED SKILLS AND KNOWLEDGE

- Chemical Safety
- Material Safety Data Sheets (MSDS)

T4 Safety Management and Risk Management

- Operating Procedures
- Preventative Maintenance Programs
- Risk Assessment
- Risk Management Plan
- Training
- Safety Audits
- Record keeping
- Permits
- Incident investigation and reporting
- Duty of care

Evidence Guide

Not Applicable

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

- Relevant Occupational Health and Safety legislation, regulations and codes of practice related to hazards presented by the use of Ammonia refrigerant in refrigeration and air conditioning systems.
- Accepted industry work procedures and the specific safety procedures and work instructions related to working with refrigeration and air conditioning systems containing Ammonia refrigerant.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to

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RANGE STATEMENT

be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

  A Preparing to enter the workplace including, the use

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RANGE STATEMENT

of work permits and clearances and isolation permissions.

B Applying work procedures and instructions as they apply to risk control measures.

C Dealing with accidents and emergencies within the scope of responsibility.

D Participation in consultation processes, identifying hazards and implementing and monitoring control measures.

E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing and repairing as well as determining the operating conditions of Ammonia vapour compression and liquid recirculation systems.

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RANGE STATEMENT

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

This unit shall be assessed concurrently, as it relates to other units undertaken in a possible skill clusters or qualification.

Components of this unit are included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 4 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ179A Repair and service ammonia refrigeration systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers specialised procedures for servicing and repairs to achieve the effective and efficient operation of refrigeration equipment using Ammonia as the refrigerant. It reinforces safe working practice and encompasses applying specialised knowledge of refrigeration principles that apply to Ammonia, following service manuals, testing, locating and rectifying faults and defective components and completing the necessary service documentation.

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Application of the Unit

Application of the Unit **4)**

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note :

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note.

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed

UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102	Fabricate, assemble and dismantle utilities

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Prerequisite Unit(s) **2)**

A	industry components
UEENEEE103A	Solve problems in ELV single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits

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Prerequisite Unit(s) **2)**

UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Note:

UEENEEJ111A and UEENEEJ113A - Those holding a ‘Certificate III in Refrigeration and Air Conditioning trade qualification or equivalent” meet the requirements of these units and their pre-requisite requirements.

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to service and repair Ammonia refrigeration systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature of work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

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ELEMENT	PERFORMANCE CRITERIA	
		others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Service and repair Ammonia refrigeration systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Measuring system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
	2.3	Checks are carried out to ensure the system or component parts are isolated, when necessary in strict accordance OHS requirements and procedures.
	2.4	Refrigerant is removed from a system safely in accordance with regulatory requirements and industry practices.
	2.5	Precautions are taken to prevent damage to components while pressure testing the system
	2.6	Pressure testing is conducted at a pressure compatible with Ammonia and in accordance with standards
	2.7	Leaks are located and rectified using testing methods appropriate to the system and in accordance with industry practices
	2.8	Oil is removed from an operational Ammonia refrigeration system in accordance with industry practices
	2.9	System is charged safely with Ammonia and compatible lubricants in accordance with industry practices
	2.10	Established procedures are used to determine actual and specified range of operating conditions from measured and calculated values as they apply

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ELEMENT		PERFORMANCE CRITERIA	
			to Ammonia vapour compression and liquid recirculation systems.
		2.11	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.13	Operating conditions are determined without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and report on servicing and repairing Ammonia refrigeration systems	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Contaminated refrigerant and lubricant is dealt with in accordance with legislative/regulatory requirements
		3.4	Operation conditions are documented, including identification of any parameter that is not within the specified range for the system.
		3.5	Work supervisor is notified of the completion of the work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and determining the operating conditions of Ammonia refrigerating systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

- **KS01-EJ179A Servicing and repair techniques for Ammonia refrigeration systems**
- Evidence shall show an understanding of the Ammonia refrigeration systems, their operating conditions, and servicing and repair techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:
- T1. Ammonia Refrigeration Systems
- Vapour Compression Systems
  - Revision of Vapour Compression Cycle
  - Properties of Ammonia
  - Safe Handling of Ammonia
- Types of Ammonia Systems
  - Direct Expansion Systems
  - Flooded Systems
  - Liquid Recirculation Systems
- Multi Staged Systems
  - Single Staged Systems
  - Multi Staged Systems
  - Cascade Systems
- T2. Operating conditions of Ammonia Refrigeration Systems
- Compressors
  - Function of the compressor
  - Types, construction and their applications
  - Capacity control of compressors
  - Factors affecting performance
  - Economiser operation
  - Types of oil separators
  - Methods of oil cooling
  - Operation and maintenance
- Lubrication and lubricants
  - Lubrication methods

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REQUIRED SKILLS AND KNOWLEDGE

- Safe handling of lubricants
- Selection of lubricants
- Oil / Ammonia separation
- Adding and removing oil from Ammonia systems
- Methods of oil recovery

- Evaporators / Cooling Units
  - Types of evaporators (air / fluid cooling)
  - Direct contact freezing
  - Secondary refrigerants
  - Evaporator defrost methods and controls
  - Operation and maintenance
- Condensers and high pressure receivers
  - Evaporative condensers
  - Water cooled condensers
  - Air cooled condensers
  - High pressure receivers
  - Operation and maintenance
- Low Pressure Receivers
  - Suction accumulators
  - Intercoolers
  - Liquid refrigerant pumps
  - Liquid level controls
  - Operation and maintenance
- Purging
  - Non condensable gases
  - Moisture: measurement and removal
  - Manual; purging of Ammonia systems
  - Automatic refrigerated purgers
  - Operation and maintenance
- Refrigerant Flow Devices
  - Expansion valves
  - Automatic liquid feed control devices
  - Pressure regulating devices
  - Operation and maintenance
  - Methods of oil recovery
- Ancillary Components
  - Strainers, isolating valves
  - Liquid level indicators

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REQUIRED SKILLS AND KNOWLEDGE

- Pressure relief valves
- Ammonia leak detectors
- Safety controls
- Operation and maintenance
- T3 Servicing and repairs
- Servicing Procedures
- Leak detection methods
- Adding refrigerant
- Removing refrigerant

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical

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EVIDENCE GUIDE

equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti-Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

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EVIDENCE GUIDE

- Pressure testing, charging/discharging refrigerant/lubricants and determining the operating conditions of Ammonia vapour compression and liquid recirculation refrigeration system.

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EVIDENCE GUIDE

A Selecting and using appropriate measuring devices correctly

B Recording measurements

C Using calculation methods accurately

D Discharging / charging refrigerant / lubricants and pressure testing the system without damage to components

E Locating and rectifying leaks

F Decontaminating and evacuating the system

G Identifying the conditions of the refrigerant (R717) at various locations in the vapour compression and liquid recirculation system.

H Documenting operating conditions correctly

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing and repairing as well as determining the operating conditions of Ammonia vapour compression and liquid recirculation systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

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EVIDENCE GUIDE

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining operating conditions using measurement and basic calculation methods of Ammonia refrigeration system. These conditions include suction and discharge pressures, ambient, evaporator and condensing temperatures, evaporator, and condenser temperature difference. Further, this unit must be demonstrated in relation to charging and discharging Ammonia (R717) system with refrigerant and lubricant in a safe and environmentally responsible manner

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ180A Install and commission ammonia refrigeration systems, components and associated equipment

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers specialised procedures for the installation and commissioning of refrigeration equipment using Ammonia as the refrigerant. It reinforces safe working practice and encompasses applying specialised knowledge of refrigeration principles that apply to Ammonia, interpreting plans and specifications, project management principles, supervision of installation, commissioning and completing the necessary commissioning documentation.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is

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Application of the Unit

4)

listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed

UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant
UEENEEJ179A	Repair and service ammonia refrigeration systems
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems

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Prerequisite Unit(s) **2)**

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE103A	Solve problems in ELV single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control

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Prerequisite Unit(s) **2**)

	systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance must be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and commission Ammonia refrigeration systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the project engineer.
	1.4	The nature of work is obtained from documentation or from project engineer to establish the scope of work to be undertaken.
	1.5	Advice is sought from the project engineer to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
2 Install and Commission Ammonia refrigeration systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed. Site establishment carried out
	2.2	Measuring system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
	2.3	Major components and pipe work is installed in compliance with all applicable Standards, Codes and Regulations
	2.4	Pressure testing is conducted at a pressure compatible with Ammonia and in accordance with applicable standards
	2.5	Precautions are taken to prevent damage to components while pressure testing the system
	2.6	Leaks are located and rectified using testing methods appropriate to the system and in

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ELEMENT	PERFORMANCE CRITERIA	
		accordance with industry practice
	2.7	System is evacuated in accordance with industry practices
	2.8	System is charged safely with Ammonia and lubricants in accordance with industry practices
	2.9	Pre operational checks are carried out on all operating and safety controls. A "Dry Run" is carried out
	2.10	System is commissioned and all adjustments made to operating and safety controls. Adjustments and setting made to all refrigerant flow metering devices and level control devices.
	2.11	Caution to be taken with temperature reduction of coolrooms and freezers. Temperatures are reduced in accordance with industry practices
	2.12	Maintenance procedures to be carried out which include inspection and cleaning of all strainers, filters and collection of oil sample for analysis
	2.13	Training given to personnel responsible for the operation and maintenance of the refrigeration system.
3 Complete work and report on installation and commissioning of Ammonia refrigeration systems	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Contaminated refrigerant and lubricant is dealt with in accordance with legislative/regulatory requirements
	3.4	Operation conditions and commissioning figures are documented, including identification of any parameter that is not within the specified range for the system.

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ELEMENT	PERFORMANCE CRITERIA
	3.5 All mechanical and electrical documentation to be marked up "As Installed"

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and commissioning refrigeration systems and associated equipment to be charged with a Ammonia refrigerant.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ180A Installation and commissioning techniques for Ammonia refrigeration systems

Evidence shall show an understanding of installation and commissioning techniques for ammonia refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Interpret Drawings

- Refrigeration Piping Schematic Diagrams
- Refrigeration Layout Diagrams
- Electrical Control Diagrams
- PLC Control Diagrams

T2 Project Management

- Work Breakdown Structures
- Network Diagrams / Gantt Charts
- Costing
- Dealing with Conflict
- Delegation

T3 Refrigerant Piping

- Pipe Sizing Principles
- Material Compatibility
- Installation Principles
- Welding
- Hydraulic Shock
- Relief Valves
- Pressure Testing/Evacuation

T4 Insulation and Vapour Barrier

- Insulation Materials

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REQUIRED SKILLS AND KNOWLEDGE

- Vapour barriers

T5 Coolroom and Freezer Construction

- Construction Materials
- Construction Methods
- Underfloor heating
- Defrost Methods
- Commissioning Procedures

T6 Refrigeration Control System Testing and Adjustment

- Refrigerant Level Controls
- Refrigerant Pressure Controls
- Temperature Controls
- Flow Controls
- Defrost methods and controls
- Central PLC System

T7 Testing and Commissioning

- Compressors
- Evaporative condensers
- Water cooled condensers
- Air cooled condensers
- High pressure receivers
- Evaporators (air / fluid cooling)
- Direct contact freezing
- Secondary refrigerants
- Start up and Shut Down Procedures

T8 Report on the install and commissioning of Ammonia refrigeration systems

- Operating conditions are recorded
- Documentation marked up “As Installed”

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment

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EVIDENCE GUIDE

Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence must

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EVIDENCE GUIDE

also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Pressure testing, charging/discharging refrigerant/lubricants and determining the operating conditions of Ammonia vapour compression and liquid recirculation refrigeration system. as described in 8) and including:

    A Reading and interpreting drawings to pipe work layouts and apparatus locations.

    B Installing, connecting , securing and aligning components and equipment and ensuring that all equipment and pipe work is compliant with codes and regulations

    C Pressure testing entire system at the appropriate design test pressures using dry nitrogen

    D Removing system contaminants and evacuating

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EVIDENCE GUIDE

E Selecting and using appropriate measuring devices correctly

F Recording measurements

G Using calculation methods accurately

H Discharging / charging refrigerant / lubricants and pressure testing the system without damage to components

I Locating and rectifying leaks

J Using methodical and efficient commissioning techniques

K Optimizing system performance and efficiency

L Identifying the conditions of the refrigerant (R717) at various locations in the vapour compression and liquid recirculation system.

M Documenting operating conditions correctly

N Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to servicing and repairing as well as determining the operating conditions of Ammonia vapour compression and liquid recirculation systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining operating conditions using measurement and basic calculation methods of Ammonia refrigeration system. These conditions include suction and discharge pressures, ambient, evaporator and condensing temperatures, evaporator, and condenser temperature difference, critical point of Ammonia (R717). Further, this unit must be demonstrated in relation to charging and discharging an Ammonia (R717) system with refrigerant and lubricant in a safe and environmentally responsible manner.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ181A Design ammonia refrigerated systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of refrigeration systems using ammonia as a refrigerant. It encompasses design skills including overall systems design, selection of components and definition of control logic.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice

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Application of the Unit **4**)

(1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practise in the work place. However practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the characteristics and behaviour of material in an engineering environment.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been

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Prerequisite Unit(s)

2)

confirmed.

UEENEEJ178A Apply safety awareness and legal requirements for ammonia refrigerant.

UEENEEJ132A Design commercial refrigeration systems and select components

UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications

UEENEEJ165A: Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE103A Solve problems in ELV single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions

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Prerequisite Unit(s)

2)

of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance must be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design ammonia refrigeration systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent and nature of the refrigeration system is determined from design specifications.
	1.3	Safety and other regulatory requirements to which the system shall comply are identified, obtained and understood.
	1.4	Work supervisor or customers are consulted to determine which functions of the system are to be used and the parameter of each and written confirmation sought.
	1.5	Design development work is planned to meet scheduled timelines in consultation with others

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ELEMENT	PERFORMANCE CRITERIA	
		involved on the work site.
2 Design ammonia refrigeration systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of ammonia refrigeration system analysis, ammonia refrigeration system components and piping, performance standards and compliance methods are applied to developing the system design.
	2.3	Safety, functional and budgetary considerations are incorporated in the installation designed.
	2.4	Equipment required for the system is selected in accordance with the design specifications and established requirements.
	2.5	Location of components of the system is documented to ensure correct operation of system functions.
	2.6	System design draft is checked for compliance with the design brief and regulatory requirements.
	2.7	System design is documented for submission to appropriate person(s) for approval.
	2.8	Solutions to unplanned situation are provided consistent with organisation's policy.
3 Obtain approval for engineering computer applications design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and designing single-stage and/or multi-stage ammonia refrigerating systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ181A Ammonia refrigeration system design

Evidence shall show an understanding of Ammonia refrigeration systems, components and piping design requirements, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Technical Standards, Codes and Regulations

- Environmental and safety considerations in the use and disposal of ammonia refrigerant
  - Toxicity of ammonia, the effects on human health and the legislative limitations imposed on ammonia refrigerant as a result
  - Flammability of ammonia, concentration, LEL
  - Environmental effects
  - Safe disposal
  - MSDS samples
  - Registration requirements for transport and on-site use
  - Relationship between ammonia system refrigerant charge and Dangerous Goods Storage regulations
  - Engine ventilation requirements and determination of ventilation rates
  - Scrubbers for elimination of the harmful effects of ammonia

T2 Ammonia refrigeration system design requirements

- Applications of refrigerant ammonia (NH3) in industrial refrigeration
  - Introduction to industrial ammonia refrigeration applications and systems
  - Applications in Industrial Refrigeration: Cool and cold storage, food processing, beverage manufacturing plants, fertilizer plants, second compression stage of CO2 systems
  - Application in environment control and air conditioning: Large scale reticulated water/secondary refrigerant systems
  - Advantages and disadvantages of ammonia refrigerant compared with other

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REQUIRED SKILLS AND KNOWLEDGE

natural and synthetic refrigerants

- Properties, application and limitations of ammonia refrigerant
  - General classification of ammonia refrigerant according to AS 1677 Refrigerating Systems
  - Common contaminants in ammonia refrigeration systems, water, oil, non-condensable and the effects of same on cycle efficiency and system wear
  - Refrigeration machine oils soluble in ammonia, oil type, applications, reactions with water
  - Thermal and transport properties of ammonia in comparison with other natural and synthetic refrigerants including the behaviour in a vapour compression cycle
- Application concepts and principles
  - Single stage vapour compression cycles with dry expansion refrigerant feed
  - Single and dual stage vapour compression cycles with liquid overfeed
  - Single stage vapour compression cycles with screw compressors and liquid overfeed
  - Cascade NH3/CO2 systems with dry expansion and liquid overfeed
  - Single and dual stage vapour compression cycles with gravity flooded refrigerant feed
  - Single and dual stage vapour compression cycles with NH3 used as a volatile secondary refrigerant
  - Dual stage vapour compression cycles with multiple (>2) saturation temperature levels
  - Automatic defrost principles including off-cycle air defrost, ambient air defrost, hot gas defrost, electric defrost and water defrost
  - Selection and sizing of ammonia pumps for liquid overfeed systems
  - Selection and sizing of high pressure and low pressure vessels
  - Refrigerant pipe sizing using Ammonia refrigerant
  - Selection of suitable refrigerant oil

T3 Ammonia refrigeration system components and piping

- Corrosion and Material selection
  - Materials compatibility table
  - Thermal and other properties of materials in use
  - Pipe material and jointing methods/materials
  - Compressors
  - Pumps, impellers and seals
  - Isolation and control valves
  - Heat exchangers

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REQUIRED SKILLS AND KNOWLEDGE

- Pipe and insulation materials, pipe stresses and pipe suspension methods
  - Mild steel pipe
  - Stainless steel pipe
  - Sharpy tested pipe
  - Post-installation insulation (in situ foaming, formed insulation, closed cell flexible insulation
  - Pre-insulated pipe material
  - Vapour barrier – importance and maintenance
- Heat exchangers
  - Finned air coolers or evaporators - induced draught, forced draught, stainless steel/aluminium, mild steel galvanized, all aluminium, stainless steel/AlMg3, all stainless steel; description of what materials are used where and for what reason; various refrigerant feed methods including advantages/disadvantages i.e. top feed, bottom feed, vertical up flow/down flow of air; fin spacing, fin thickness; impact of geometry on fluid pressure drops
  - Condensers – evaporative, air cooled, air cooled adiabatically assisted, water cooled shell and tube, water cooled plate/plate, water cooled plate and shell, cascade shell and tube, cascade plate/plate, cascade plate and shell; material selection for condensers, importance of discharge temperature for condenser design
  - Cooling towers
  - Intercoolers and economizers of the closed type, sizing of liquid subcooling coils and tube bundles
  - Liquid coolers or evaporators – plate/plate, plate/shell, shell and tube; material selections, refrigerant feed methods, oil management
  - Screw compressor oil coolers – plate/plate type, shell and tube type, water cooled, refrigerant cooled, surface enhancement options
  - Heat recovery – shell and tube de-superheaters, plate/plate de-superheaters, heat recovery condensers of various types
- System control and monitoring
  - Compressor capacity control – pressure and temperature signals
  - Room temperature and humidity control – understanding the principle of cooling and re-heating air streams to control absolute moisture contents
  - Control of condensers – optimization of overall plant C.O.P.
  - Floating condensing pressures
  - Control of fluid temperatures within the system – oil, secondary refrigerants, subcooling
  - Control of flows – thermostatic expansion valves, low pressure floats, high pressure floats, motorized valves, electronic expansion valves, hand regulating valves, oil return systems between compressor oil separators and compressors

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REQUIRED SKILLS AND KNOWLEDGE

- Pressure controllers - evaporating pressure controllers, thermostatic controllers, hot gas bypass valves, crankcase pressure regulators, overflow valves, NH3 pump pressure control, flow controllers, defrost pressure controllers
- Defrost control
- PLC control systems
- SCADA systems

- Water treatment and desiccant dehumidifiers
  - Condenser water treatment – purpose and legislative requirement
  - Treatment of secondary refrigerant loops including monitoring
  - Desiccant dehumidifiers and their role in infiltration minimization, defrost control and energy savings
- Equipment Selection
  - Use computer software and manufacturers data to select major components of an Ammonia refrigeration plant

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

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EVIDENCE GUIDE

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design ammonia refrigeration systems as described in 8) and including:

    A Understanding required operating functions and parameters from the design specification

    B Developing the design within the safety, regulatory and functional requirements and budget limitations

    C Documenting and presenting design effectively

    D Successfully negotiating design alteration requests

    E Obtaining approval for final design

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing ammonia refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing ammonia refrigeration systems in any of the following:

- In relation to at least two of the following types of (2 single-stage or 2 multi-stage or 1 single-stage and 1 multi-stage) ammonia refrigeration systems encompassing major components (i.e. condenser, compressors, evaporator, and flash chamber/flash intercooler), associated components and controls and on at least two occasions:

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ182A Repair and service secondary refrigeration systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers maintaining the effective and efficient operation of refrigeration equipment using non phase changing secondary refrigerant systems. It reinforces safe working practice, utilises service manuals, encompasses applying specialised knowledge of refrigeration principles to test and perform maintenance operations to these systems and to locate defective components and repair faults, completing reports on service and performance outcomes.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is

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Application of the Unit

4)

listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note.
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

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Prerequisite Unit(s) **2)**

UEENEEE103A	Solve problems in ELV single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage

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Prerequisite Unit(s) **2**)

	installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Note:

UEENEEJ111A and UEENEEJ113A - Those holding a 'Certificate III in Refrigeration and Air Conditioning trade qualification or equivalent" meet the requirements of these units and their pre-requisite requirements.

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to service and repair secondary refrigeration systems.	1.1	The type of secondary refrigeration system, components and operation are understood.
	1.2	OHS procedures are identified, MSDS are obtained and understood, risk control measures are followed, PPE worn.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented.
	1.4	The extent of faults is determined from reports, other documentation, observation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety
2 Carry out maintenance requirements	2.1	OHS requirements, regulation, workplace procedures and risk control measures and are followed.
	2.2	Components are checked as being isolated, where necessary, in strict accordance OHS requirements and procedures.
	2.3	Maintenance tests are performed on the primary cooling source, operating pressures, operating current, refrigerant charge, secondary flow rates, condenser cooling system, document results including any systems faults or non compliance to operational specifications.
	2.4	Perform operational maintenance tests on the secondary refrigerant pumping / circulation devices, recording pressure and flow rates, document results, including faults or non compliance to system specification.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Use test kit and follow approved OH&S procedure including PPE, check the chemical integrity (dilution rate, anti bacterial and anti corrosion rates) of the secondary refrigerant, document result or any non compliance.
	2.6	Secondary refrigerant pipework checked for leaks, insulation checked for soundness and pipework stability.
	2.7	System components evaporators, blowers, other heat exchangers, heat recovery or defrost systems are checked for correct operation and cleanliness.
	2.8	Test the control system operation, including safety controls, follow all OH&S guidelines, document results including any faults or non conformity to system specification.
3 Repair secondary refrigeration systems.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Justification for solutions used to solve machine problems is documented.
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.
	3.5	Perform any required repairs to systems components to achieve compliance to design operation and manufactures recommendation for effective operation.
	3.6	Adjust control system as required to achieve compliance to design operation and manufactures recommendation, for effective operation.
	3.7	Record flows, pressures and temperatures obtained before and after repair and compare to specifications, implementing contingency measures where required, to ensure compliance to design operation and manufactures recommendation for effective operation.

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ELEMENT	PERFORMANCE CRITERIA	
4 Complete reports on maintenance and repair activities	4.1	Work completed safely, compliance is maintained with OH&S risk control measures.
	4.2	Work area is cleaned and made safe in accordance with established workplace procedures and practices.
	4.3	Report is written for service / maintenance and repair activities on secondary refrigeration system, non compliance after repair is reported to appropriate person.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in single and three phase low voltage machines.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ182A Service and repair secondary refrigeration systems

Evidence shall show an understanding the secondary refrigeration systems, components, maintenance service and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Secondary refrigeration systems

- Introduction to secondary refrigeration systems
  - Safety
  - Basic operation
  - Typical applications
  - Safety in handling Secondary Refrigerants
  - Types of secondary Refrigerants
  - Need for anti bacterial and corrosion inhibitor use
  - Use of PPE (Personal Protective Equipment)
- Major components location, purpose and operation
  - Safety
  - Major components Operation
  - Pipe work and insulation
  - Pumps
  - Cooling coils
  - Low temperature defrost systems
  - Heat recovery coils
  - Control system, pressure temperature, and safety
  - Control, balance and operational valves

T2 Service and repair secondary refrigeration systems

- Carry out repairs to secondary refrigerant systems.

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REQUIRED SKILLS AND KNOWLEDGE

- Safety
- Appropriate personnel contacted before isolation repairs to pumps
- Additions required to maintain chemical integrity of refrigerant
- Repairs to cooling coils/ freezing coils
- Repair system leaks
- Repair pipework or insulation
- Repair / replace defective control valves
- Repair / replace defective control system component
- Refrigerant disposal EPA requirements

- Complete report on repair activities
- Tools and equipment for repair work
- Applicable Standards and Codes

T3 Maintenance procedures for secondary refrigeration systems

- Maintenance requirements of secondary refrigeration systems.
  - Safety
  - Operation of primary cooling source
  - Tool and equipment
  - Operation of pumps
  - Chemical integrity of refrigerant
  - Cooling coils/ freezing coils operation
  - Leak detection additives
  - Leak test system
  - Pipework and insulation check
  - Control valve test
  - Control system check
- Complete report on maintenance activities
- Tools and equipment for maintenance work
- Applicable Standards and Codes

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction

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EVIDENCE GUIDE

with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also

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EVIDENCE GUIDE

comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

Service and repair secondary refrigeration systems as described in 8) and including:

A Applying logical diagnostic methods

B Using fault scenarios to test the cause of system faults

C Identifying faults and competency needed to rectify them

D Rectifying faults in system controls

E Verifying that the system operates correctly

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in Service and repair secondary refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note: Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to service and repair including all of the following

secondary refrigeration systems , incorporating major components, primary chillers and circuits, secondary piping circuits, pumps, defrost systems, heat recovery systems, control systems and other associated secondary refrigeration components

This unit must be demonstrated in relation to service and repair in the following secondary refrigeration systems and components:

- Evaporators/cooling coils, forced, natural draft,
- Refrigerant flow controls,
- Refrigerant piping and accessories,
- Cycling controls,
- Safety controls
- Defrost controls,
- Solenoid valves and associated piping,
- Heat recovery systems,
- Motors
- Pumps, positive displacement and centrifugal,
- Piping, insulation and associated equipment, air purgers.
- Safe handling and testing of glycol and other secondary fluids.

All of the following apparatus:

- Chilled water systems, (primary system)
- Ice bank systems,

All of the following systems

- cool rooms
- freezer rooms
- merchandising and display cabinets
- other commercial or industrial applications.

Generic terms used throughout this Vocational Standard shall be regarded as part of the

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RANGE STATEMENT

Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ183A Design secondary refrigerant systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of secondary refrigeration systems. It encompasses design skills including overall systems design, selection of components and definition of control logic.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice

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Application of the Unit **4**)

(1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practise in the work place. However practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the characteristics and behaviour of material in an engineering environment.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been

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Prerequisite Unit(s)

2)

confirmed.

UEENEEJ132A Design commercial refrigeration systems and select components

UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications

UEENEEJ165A: Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE103A Solve problems in ELV single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow

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Prerequisite Unit(s) **2)**

controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance must be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design secondary refrigeration systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent and nature of the refrigeration system is determined from design specifications.
	1.3	Safety and other regulatory requirements to which the system shall comply are identified, obtained and understood.
	1.4	Work supervisor or customers are consulted to determine which functions of the system are to be used and the parameter of each and written confirmation sought.
	1.5	Design development work is planned to meet scheduled timelines in consultation with others

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ELEMENT	PERFORMANCE CRITERIA	
		involved on the work site.
2 Design secondary refrigeration systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of secondary refrigeration system analysis, secondary refrigeration system components and piping, performance standards and compliance methods are applied to developing the system design.
	2.3	Safety, functional and budgetary considerations are incorporated in the installation designed.
	2.4	Equipment required for the system is selected in accordance with the design specifications and established requirements.
	2.5	Location of components of the system is documented to ensure correct operation of system functions.
	2.6	System design draft is checked for compliance with the design brief and regulatory requirements.
	2.7	System design is documented for submission to appropriate person(s) for approval.
	2.8	Solutions to unplanned situation are provided consistent with organisation's policy.
3 Obtain approval for engineering computer applications design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing multi-stage cascade and/or liquid recirculation secondary refrigeration systems. All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

KS01-EJ183A Secondary refrigeration system design

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in

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the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design secondary refrigeration systems as described in 8) and including:

    A Understanding required operating functions and parameters from the design specification

    B Developing the design within the safety, regulatory and functional requirements and budget limitations

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C Documenting and presenting design effectively

D Successfully negotiating design alteration requests

E Obtaining approval for final design

F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing secondary refrigeration systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different (2 multi-stage cascade or 2 liquid recirculation or 1 multi-stage and 1 liquid recirculation) secondary refrigeration systems encompassing major components (i.e. heat exchanger, condenser, compressor, accumulator, and pump), associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ184A Apply safety awareness and legal requirements for carbon dioxide refrigerant

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the safety and legal requirements to handle, use and store hydrocarbon refrigerants. All safety aspects are covered to Australian and International standards. Legal requirements are covered at local, State&National level.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also

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Application of the Unit **4**)

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is to regulations directly relating to all OH&S and AS requirements.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

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Prerequisite Unit(s) **2)**

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work with carbon dioxide refrigerant	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Work area access permits are obtained from appropriate personnel according to established procedures.
	1.3	Preparations for electrical and non-electrical isolation are carried out to prevent creation of hazards from loss of machine/system/process control according to established procedures.

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ELEMENT		PERFORMANCE CRITERIA	
		1.4	Tools and equipment needed for the work are checked for safety and correct functionality according to established procedures and regulatory requirements.
2	Apply safe working practices in using carbon dioxide refrigerant	2.1	Workplace procedures and work instructions for controlling risk are followed accurately.
		2.2	Workplace procedures for dealing with accidents, fires and emergencies are followed according to work procedures and scope of responsibility and competencies.
3	Follow workplace procedures for hazard identification and risk control of carbon dioxide refrigerant	3.1	Hazards are identified and control measures implemented and monitored through active participation in the consultation process with employer and other employees.
		3.2	Hazards in the work area are recognised and reported to appropriate personnel according to established procedures.
		3.3	OHS records of incidents are completed in accordance with regulatory requirements and established procedures.
		3.4	Workplace instructions and training are followed accurately within established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and

applying OHS practices in relation to hydrocarbon refrigerants.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ184 A Safe working practices with carbon dioxide refrigerant

Evidence shall show an understanding of safe working practices with carbon dioxide refrigerant and relevant Standards, Codes and Regulations an extent indicated by the following aspects:

T1 Introduction to Carbon Dioxide refrigerant

- Refrigerants and CFC/HFC phase out
- Introduction to Carbon Dioxide – CO2
- Benefits of using Carbon Dioxide as a Refrigerant (R744)

T2 Introduction to HAZCHEM Codes and Material Safety Data Sheets (MSDS)

- Classification of Dangerous Goods
- HAZCHEM CODE
- Refrigerant 2RE Hazchem Codes
- UN (United Nations) Number
- Material Safety Data Sheets (MSDS)
- Personal Protection Equipment (PPE)

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REQUIRED SKILLS AND KNOWLEDGE

T3 Carbon Dioxide Plant Safety

- Carbon Dioxide CO2 R744 Detectors
  - Appropriate Type
  - Care ,Maintenance and Installation
- Cylinder Regulators CO2
  - All currently available regulators provide vapour feed only
  - Pressure readings (bottle and line)
- Refrigerant Cylinders CO2
- Refrigerant conditions
  - Hazards and related safe working practices (dangerous system pressures)
  - Pressure to temperature conversion (Saturated P/T is only between 430 kPa and 4399kPa)
- Carbon Dioxide Relief Valves AS1894-1997

T4 Emergency Management

- Planning for emergencies
- The emergency plan
- Risk Assessment

T5 First Aid for CO2 Exposure

- Type of exposure
  - Acute
  - Chronic
  - Swallowed
  - Eye
  - Skin
  - Inhaled
- Carbon Dioxide CO2 R744 is a narcotic and an asphyxiant in large concentrations in air. Concentrations above 10% in air may lead to death very quickly.
- First Aid Facilities
  - Ensure plenty of drinking water
  - Safety shower
  - Eye wash station eye wash bottle available
  - Oxygen for resuscitation
- Always seek urgent medical attention when an incident occurs with Carbon Dioxide CO2 R744 refrigerant.
- DRABC – steps or procedures that must be carried out if a first aid person or emergency personnel come across a person who is unconscious

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REQUIRED SKILLS AND KNOWLEDGE

- SCBA – Self contained breathing apparatus. Compressed air comes in bottles strapped to the user's body. Note all personnel who may be required to use SCBA type equipment require specialised training

T6 Applicable Standards and Codes

- Hazards associated with Carbon Dioxide (MSDS)
- AS1894 – 1997
- New South Wales OH&S Act 2000 No40
- Storage and handling of workplace Dangerous Goods National Code of Practice (NOHSC:2017 – 2001
- Dangerous Goods Act
- AS1940-2004 The storage and handling of flammable and combustible liquids
- AS/NZS 1677
- AS/NZS 1571
- IIAR Bulletins
- ANSI/ASHRAE Standards
- IOR Safety code for Refrigerating Systems utilising Carbon Dioxide

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package..

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that,

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EVIDENCE GUIDE

in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

  A Preparing to enter the workplace including, the use of work permits and clearances and isolation permissions.

  B Applying work procedures and instructions as they apply to risk control measures.

  C Dealing with accidents and emergencies within the scope of responsibility.

  D Participation in consultation processes, identifying hazards and implementing and monitoring control measures.

  E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above, evidence should show demonstrated competency in applying specific hydrocarbon OHS practices in the workplace.

Method of assessment

9.**4**)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent Assessment and relationship with other units

9.**5**)

This unit shall be assessed concurrently, as it relates to other units undertaken in a possible skill clusters or qualification.

Components of this unit are included in the critical aspects of evidence of all units to help ensure the appropriate level of responsibility for safety has been acquired.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

a) Relevant Occupational Health and Safety legislation, regulations and codes of practice related to hazards presented by the use of carbon dioxide refrigerant in refrigeration and air conditioning systems.
b) Accepted industry work procedures and the specific safety procedures and work instructions related to working with refrigeration and air conditioning systems containing a carbon dioxide refrigerant.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ185A Repair and service carbon dioxide refrigeration systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers specialised procedures for servicing and repairs to achieve the effective and efficient operation of refrigeration equipment using carbon dioxide (CO_2) as a refrigerant excluding self contained systems. It reinforces safe working practice and encompasses applying specialised knowledge of refrigeration principles that apply to carbon dioxide, following service manuals, testing, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through

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Application of the Unit

4)

recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note.
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed

UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ184A	Apply safety awareness and legal requirements for carbon dioxide refrigerant
UEENEEE101 A	Apply Occupational Health and Safety regulations, codes and practices in the

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Prerequisite Unit(s) **2)**

	workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE103A	Solve problems in ELV single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems

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Prerequisite Unit(s) **2)**

UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Note:

UEENEEJ111A and UEENEEJ113A - Those holding a 'Certificate III in Refrigeration and Air Conditioning trade qualification or equivalent" meet the requirements of these units and their pre-requisite requirements.

2.2) Literacy y and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance must be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to service and repair carbon dioxide refrigeration systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature of work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

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ELEMENT		PERFORMANCE CRITERIA	
			others.
		1.6	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Service and repair carbon dioxide refrigeration systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Measuring system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
		2.3	Checks are carried out to ensure the system or component parts are isolated, when necessary in strict accordance OHS requirements and procedures.
		2.4	Refrigerant is removed from a system safely in accordance with regulatory requirements and industry practices.
		2.5	Precautions are taken to prevent damage to components while pressure testing the system
		2.6	Pressure testing is conducted at a pressure compatible with carbon dioxide and in accordance with standards
		2.7	Leaks are located and rectified using testing methods appropriate to the system and in accordance with industry practices
		2.8	System is evacuated to the required level and cleaned of all moisture and other contaminants in accordance with industry practices
		2.9	System is charged safely with refrigerant grade carbon dioxide and compatible lubricants in accordance with industry practices
		2.10	Established procedures are used to determine actual and specified range of operating

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ELEMENT	PERFORMANCE CRITERIA	
		conditions from measured and calculated values as they apply to sub critical carbon dioxide vapour compression and liquid recirculation/cascade systems.
	2.11	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.13	Operating conditions are determined without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and report on servicing and repairing sub - critical carbon dioxide refrigeration systems.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Contaminated refrigerant and lubricant is dealt with in accordance with legislative/regulatory requirements
	3.4	Operation conditions are documented, including identification of any parameter that is not within the specified range for the system.
	3.5	Work supervisor is notified of the completion of the work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and determining the operating conditions of both sub - critical vapour compression and liquid recirculating carbon dioxide refrigerating systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ185 A Servicing and repair techniques for carbon dioxide refrigeration Systems

Evidence shall show an understanding of carbon dioxide refrigeration systems, operation, components, service and repair techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Carbon Dioxide Refrigeration Systems

- Introduction to Carbon Dioxide refrigeration System
- Benefits of using Carbon Dioxide as a Refrigerant
- Thermophysical Properties
- Introduction to Liquid recirculation /Cascade system employing Carbon Dioxide refrigerant at Sub-Critical condition.
  - Systems and Major components
  - Basic operation
  - Typical applications

T2 Operating conditions of carbon dioxide Refrigeration Systems

- CO2 Refrigeration Compressors and lubricants
  - Types, construction and their applications (reciprocating, screw,)
  - Types of compatible compressor oil (POE), (PAO)
  - Safe handling of lubricants for CO2 applications (MSDS - POE's, PAO)
- System components, construction and operation
  - CO2 Low temperature evaporators design features
  - Medium Temperature Liquid re-circulation evaporators
  - Hand expansion valves (medium temp.)
  - Electronic expansion valves (low temp)

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REQUIRED SKILLS AND KNOWLEDGE

- Cryogenic pressure relief devices
- Plate heat exchangers
- Liquid –Suction heat exchangers
- Liquid CO2 Refrigerant Pumps
- "Q" Min and "Q" Max valves
- Interconnecting piping
- Refrigerant receiver
- Isolation valves

- Applicable Standards and Codes
  - Hazards associated with Carbon Dioxide (MSDS)
  - AS/NZS 1677
  - AS/NZS 1571
  - IIAR Bulletins
  - ANSI/ASHRAE Standards
  - IOR Safety code for Refrigerating Systems utilising Carbon Dioxide

T3 Servicing and repair techniques for carbon dioxide refrigeration systems

- Service Gauges
  - Appropriate Type
  - Care and Maintenance of Gauges and hoses
- Service procedures
  - Charging CO2 into a system in both vapour and liquid form
  - Discharging CO2 from a system safely
  - Pressure testing
  - System and component isolation
  - Leak detection methods for CO2
- Cylinder Regulators CO2
  - All currently available regulators provide vapour feed only
  - Pressure readings (bottle and line)
- Refrigerant Cylinders CO2
- Refrigerant conditions
  - Hazards and related safe working practices (dangerous system pressures)
  - Pressure to temperature conversion (Saturated P/T is only between 430 kPa and 4399kPa)
- System standing pressure as a result of power loss.
- Moisture problems with CO2 systems

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Pressure testing, charging/discharging refrigerant/lubricants and determining the operating conditions of Carbon Dioxide vapour compression and volatile secondary (liquid recirculation) system as described in 8) and including:

    A Selecting and using appropriate measuring devices correctly

    B Recording measurements

    C Using calculation methods accurately

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EVIDENCE GUIDE

D Discharging / charging refrigerant / lubricants and pressure testing the system without damage to components

E Locating and rectifying leaks

F Decontaminating and evacuating the system

G Identifying the conditions of the refrigerant (R744) at various locations in the vapour compression and volatile secondary (liquid recirculation) system

H Documenting operating conditions correctly

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to servicing and repairing as well as determining the operating conditions of Carbon Dioxide vapour compression and liquid recirculation/cascade system.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining operating conditions using measurement and basic calculation methods of carbon dioxide vapour compression and volatile secondary (liquid recirculation) system. These conditions include suction and discharge pressures, ambient, evaporator and condensing temperatures, evaporator, and condenser temperature difference, critical point, triple point, trans critical and sub-critical refrigerant conditions of carbon dioxide (R744). Further, this unit must be demonstrated in relation to charging and discharging a carbon dioxide (R744) system with refrigerant and lubricant in a safe and environmentally responsible manner. This excludes self contained systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ186A Install and commission carbon dioxide refrigeration systems, components and associated equipment

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers specialised procedures for the installation and commissioning to achieve effective and efficient operation of refrigeration equipment using carbon dioxide (CO_2) as a refrigerant excluding self contained systems. It reinforces safe working practice and encompasses applying specialised knowledge of refrigeration principles that apply to carbon dioxide, following design specifications, testing, locating and rectifying faults and defective components and completing the necessary installation and commissioning documentation.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through

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Application of the Unit

4)

recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ184A	Apply safety awareness and legal requirements for carbon dioxide refrigerant
UEENEEJ185A	Repair and service carbon dioxide refrigeration systems
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems

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Prerequisite Unit(s) **2)**

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE103A	Solve problems in ELV single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control

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Prerequisite Unit(s) **2**)

	systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install major components and associated equipment.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature of work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Component and equipment installation is appropriately sequenced in accordance with job schedule.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Install major components and associated equipment.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits / machines/plant are checked as being isolated where necessary in strict accordance with OHS requirements and procedures
	2.3	Components and equipment are installed to comply with technical standards, job specifications and requirements with sufficient access to affect electrical and pipe work connections and maintenance.
	2.4	Components and equipment are installed straight and square in the required locations and within acceptable tolerances

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Pressure testing is conducted at a pressure compatible with carbon dioxide and in accordance with standards
	2.6	Leaks are located and rectified using testing methods appropriate to the system and in accordance with industry practices
	2.7	System is evacuated to the required level and cleaned of all moisture and other contaminants in accordance with industry practices
	2.8	System is charged safely with refrigerant grade carbon dioxide and compatible lubricants in accordance with industry practices
	2.9	Established procedures are used to determine actual and specified range of operating conditions from measured and calculated values as they apply to carbon dioxide vapour compression and volatile secondary (liquid recirculation/cascade) systems.
	2.10	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.12	Operating conditions are determined without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete Installation and commissioning work and document performance data	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Final check of the installed components and equipment is made to verify that it complies to all requirements.
	3.3	"As - installed' components and equipment is documented and an appropriate person or persons notified in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	3.4	Commissioning work is appropriately sequenced in accordance with job specification
	3.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	3.6	The extent of the system and location of system components is determined from site inspection and/ or job specifications and diagrams
	3.7	System control settings and operating parameters are determined from job specifications and requirements
	3.8	Tools equipment and testing devices needed to commission a carbon dioxide refrigerant system are obtained and checked for correct operation and safety
	3.9	Pre commissioning checks are undertaken to ensure all components are in place and secure
	3.10	The need to test or measure a live operating CO_2 system is determined in strict accordance with OH&S requirements and when necessary conducted within established safety procedures.
	3.11	Carbon Dioxide refrigeration system pressure controls, valves, pumps and regulators are adjusted to their required settings.
	3.12	Testing /measuring devices are used to observe the operation of refrigeration system and fine adjustments of controls are made as necessary.
	3.13	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	3.14	Unexpected situations are dealt with safely and with the approval of an authorised person.
	3.15	Commissioning is conducted efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices

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ELEMENT	PERFORMANCE CRITERIA
	3.16 Work site is cleaned and made safe in accordance with established procedures
	3.17 Results of commissioning are documented, including final operating parameters of the system.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and determining the operating conditions of both vapour compression and liquid recirculating carbon dioxide refrigerating systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ186A Installation and commissioning procedures for Carbon Dioxide refrigeration systems

Evidence shall show an understanding of installation and commissioning procedures for sub-critical carbon dioxide refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Materials and Installation procedures

- Material selection
- Copper pipe standards
- Pipe connections
- Pipe supports hangers and connections
- Arrangement of isolation valves
- Location of relief valves

T2 Commissioning

- Pressure testing
- Evacuation and dehydration
- Charging refrigerant and lubricant
- System testing and adjustment
- Documentation

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

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EVIDENCE GUIDE

competency in this unit

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install CO_2 refrigeration system components pipe work and associated equipment including :

    A Reading and interpreting drawings to pipe work layouts and apparatus locations.

    B Installing, connecting , securing and aligning components and equipment and ensuring that all equipment and pipe work is compliant with codes and regulations

    C Pressure testing entire system at the appropriate design test pressures using dry nitrogen

    D Removing system contaminants and evacuating

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EVIDENCE GUIDE

E Selecting and using appropriate measuring devices correctly

F Recording measurements

G Using calculation methods accurately

H Discharging / charging refrigerant / lubricants and pressure testing the system without damage to components

I Locating and rectifying leaks

J Using methodical and efficient commissioning techniques

K Optimizing system performance and efficiency

L Identifying the conditions of the refrigerant (R744) at various locations in the vapour compression and volatile secondary (liquid recirculation) system

M Documenting operating conditions correctly (commissioning)

N Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in installation techniques as well as Commissioning skills and a clear understanding of operating conditions of Carbon Dioxide vapour compression and volatile secondary (liquid recirculation/cascade) system/s.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining operating conditions using measurement and basic calculation methods of carbon dioxide vapour compression and volatile secondary (liquid recirculation) system.

Furthermore, this unit must be demonstrated in relation to installing, connecting and commissioning the following Carbon Dioxide refrigeration system and components and associated equipment.

Major components shall include compressors, cascade condensers, evaporators, liquid recirculation pump/s. Associated equipment shall include refrigerant piping, refrigerant flow controls, cycling controls, safety controls, relief valves, isolation valves, monitoring and inspection accessories. Note: Steel pipe welding competency is not covered by this unit.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ187A Design carbon dioxide refrigerated systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the design of refrigeration systems using carbon dioxide as a refrigerant. It encompasses applying knowledge of complex refrigeration systems, safety and regulatory requirements, developing alternative design schemes based on a design brief and customer requirements and documenting system design.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

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Application of the Unit **4**)

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practise in the work place. However practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the characteristics and behaviour of material in an engineering environment.

Pre-Requisites

Prerequisite Unit(s) **2**)

2.1) Competencies

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Prerequisite Unit(s) **2)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ132A Design commercial refrigeration systems and select components

UEENEEJ184A Apply safety awareness and legal requirements for carbon dioxide refrigerant

UEENEEJ129A Establish heat loads for commercial refrigeration and/or air conditioning applications

UEENEEJ165A: Evaluate thermodynamic and fluid parameters of refrigeration systems

UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

and

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE103A Solve problems in ELV single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions

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Prerequisite Unit(s)

2)

of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance must be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design carbon dioxide refrigeration systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	The extent and nature of the refrigeration system is determined from design specifications.
	1.3	Safety and other regulatory requirements to which the system shall comply are identified, obtained and understood.
	1.4	Work supervisor or customers are consulted to determine which functions of the system are to be used and the parameter of each and written confirmation sought.
	1.5	Design development work is planned to meet scheduled timelines in consultation with others

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ELEMENT	PERFORMANCE CRITERIA	
		involved on the work site.
2 Design carbon dioxide refrigeration systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of carbon dioxide refrigeration system analysis, carbon dioxide refrigeration system components and piping, performance standards and compliance methods are applied to developing the system design.
	2.3	Safety, functional and budgetary considerations are incorporated in the installation designed.
	2.4	Equipment required for the system is selected in accordance with the design specifications and established requirements.
	2.5	Location of components of the system is documented to ensure correct operation of system functions.
	2.6	System design draft is checked for compliance with the design brief and regulatory requirements.
	2.7	System design is documented for submission to appropriate person(s) for approval.
	2.8	Solutions to unplanned situation are provided consistent with organisation's policy.
3 Obtain approval for engineering computer applications design	3.1	System design is presented and explained to client representative and/or other relevant person(s).
	3.2	Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation's policy.
	3.3	Final design is documented and approval obtained from appropriate person(s).
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing subcritical and/or trans-critical carbon dioxide refrigerating systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ187 A Carbon dioxide refrigeration system design requirements

Evidence shall show an understanding of Carbon Dioxide refrigeration systems, components and piping design requirements, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Technical Standards, Regulations and Codes for carbon dioxide refrigeration systems

- Standard philosophy and format
- Standards, regulations and codes that apply to CO2 refrigeration systems
- Equipment manufactures specifications

T2 Carbon Dioxide refrigeration system design requirements

- Possible areas of applications of CO2 refrigeration systems
  - Mobile air conditioner
  - Heat pump water heater
  - Commercial refrigeration
- Thermodynamic properties of CO2
  - CO2 phase diagram
  - CO2 properties tables and chart
- Conventional refrigeration cycle versus CO2 refrigeration cycle
  - T-s and p-h diagram representations
  - Isentropic efficiency
  - Volumetric efficiency
- Types of CO2 refrigeration system configurations
  - Sub-critical operation
  - Trans-critical operation

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REQUIRED SKILLS AND KNOWLEDGE

- Cascade systems
- Performance analysis of CO2 refrigeration systems
  - Sub-critical cycle
  - Trans-critical cycle
  - Cascade systems

T3 Carbon Dioxide refrigeration system components and piping

- Design preliminaries
  - System operating parameters
  - Project specifications
  - Equipment selection criteria
  - Selection tables, charts and catalogues
- Heat exchanger selection
  - Selection of evaporators
  - Selection of condensers
  - Selection of coolers
- Compressor selection
- Liquid expansion devices selection
- System load balance point
- Refrigeration line design and sizing
- Automatic controls
- Safety devices

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs

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EVIDENCE GUIDE

and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design carbon dioxide refrigeration systems as described in 8) and including:

    A Understanding required operating functions and parameters from the design specification

    B Developing the design within the safety, regulatory and functional requirements and budget limitations

    C Documenting and presenting design effectively

    D Successfully negotiating design alteration requests

    E Obtaining approval for final design

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing carbon dioxide refrigeration systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different (2 subcritical or 2 trans-critical or 1 subcritical and 1 trans-critical) carbon dioxide refrigeration systems encompassing major components (i.e. cooler, condenser, compressor and evaporator), associated components and controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ188A Repair and service self contained carbon dioxide refrigeration and heat pump systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers specialised procedures for servicing and repairs to achieve the effective and efficient operation of self contained refrigeration and heat pump equipment using carbon dioxide (CO_2) as a refrigerant. It reinforces safe working practice and encompasses applying specialised knowledge of refrigeration principles that apply to carbon dioxide, following service manuals, testing, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that

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Application of the Unit

4)

all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note.
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed

UEENEEJ184A Apply safety awareness and legal requirements for carbon dioxide refrigerant

and

UEENEEJ155A Service refrigeration appliances

UEENEEJ054B Find and rectify faults in appliance motors and associated controls

UEENEEJ062B Find and rectify faults in appliance motors and associated controls

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

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Prerequisite Unit(s)

2)

UEENEEJ195A Establish the basic operating conditions of vapour compression systems - appliances

and

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE103A Solve problems in ELV single path circuits

or

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEP017A Locate and rectify faults in low voltage

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Prerequisite Unit(s) **2)**

composite appliances using set procedures

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE103A Solve problems in ELV single path circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

Note:

UEENEEJ111A - Those holding a 'Certificate III in Refrigeration and Air Conditioning trade qualification or equivalent" meet the requirements of these units and their pre-requisite requirements.

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Prerequisite Unit(s)	**2**)
	UEENEEJ155A - Those holding a 'Certificate III in Appliance Servicing trade qualification or equivalent" meet the requirements of these units and their pre-requisite requirements.

Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance must be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to service and repair self contained carbon dioxide refrigeration and heat pump systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control

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ELEMENT	PERFORMANCE CRITERIA	
		measures is sought from the work supervisor.
	1.4	The nature of work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Service and repair self contained carbon dioxide refrigeration and heat pump systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Measuring system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
	2.3	Checks are carried out to ensure the system or component parts are isolated, when necessary in strict accordance OHS requirements and procedures.
	2.4	Refrigerant is removed from a system safely in accordance with regulatory requirements and industry practices.
	2.5	Precautions are taken to prevent damage to components while pressure testing the system
	2.6	Pressure testing is conducted at a pressure compatible with carbon dioxide and in accordance with standards
	2.7	Leaks are located and rectified using testing methods appropriate to the system and in accordance with industry practices
	2.8	System is evacuated to the required level and cleaned of all moisture and other contaminants

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ELEMENT	PERFORMANCE CRITERIA	
		in accordance with industry practices
	2.9	System is charged safely with refrigerant grade carbon dioxide and compatible lubricants in accordance with industry practices
	2.10	Established procedures are used to determine actual and specified range of operating conditions from measured and calculated values as they apply to carbon dioxide vapour compression systems.
	2.11	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.13	Operating conditions are determined without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and report on servicing and repairing self contained carbon dioxide refrigeration and heat pump systems.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Contaminated refrigerant and lubricant is dealt with in accordance with legislative/regulatory requirements
	3.4	Operation conditions are documented, including identification of any parameter that is not within the specified range for the system.
	3.5	Work supervisor is notified of the completion of the work in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and determining the operating conditions of self contained carbon dioxide vapour compression systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ188A Trans-Critical Carbon Dioxide Refrigeration and Heat Pump Systems

Evidence shall show an understanding of servicing and repair techniques for Trans-critical Carbon Dioxide refrigeration and Heat Pump Systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Introduction to Carbon Dioxide refrigeration and heat pump systems encompassing -

- Benefits of using Carbon Dioxide as a Refrigerant
- Thermophysical Properties

T2 Access procedures Introduction to self contained systems employing Carbon Dioxide refrigerant at Trans-Critical condition.

- Systems and major components
- Basic Operation
- Typical applications
  - Domestic refrigerators and freezers
  - Refrigerated cabinets
  - Heat pump water heaters

T3 Servicing tools, equipment and procedures

- Service Gauges
  - Appropriate Type
  - Care and Maintenance of Gauges and hoses
- Service procedures
  - Charging CO2 into a system in both vapour and liquid form
  - Discharging CO2 from a system safely

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REQUIRED SKILLS AND KNOWLEDGE

- Pressure testing
- System and component isolation
- Leak detection methods for CO2
- Cylinder Regulators CO2
  - All currently available regulators provide vapour feed only
  - Pressure readings (bottle and line)
- Refrigerant Cylinders CO2
- Refrigerant conditions
  - Hazards and related safe working practices (dangerous system pressures)
  - Pressure to temperature conversion (Saturated P/T is only between 430 kPa and 4399kPa)
- System standing pressure as a result of power loss.
- Moisture problems with CO2 systems

T4 CO2 refrigeration compressors and lubricants

- Types, construction and their applications
- Types of compatible compressor oil (POE), (PAO)
- Safe handling of lubricants for CO2 applications (MSDS - POE's, PAO)

T5 System components, construction and operation

- CO2 evaporators design features
- CO2 sub-cooler design features
- Refrigerant flow controls
  - Capillary tubes and accurator
  - Electronic expansion valves
- Pressure relief devices
- Liquid –Suction heat exchangers

T6 Applicable Standards and Codes

- Hazards associated with Carbon Dioxide (MSDS)
- AS/NZS 1677
- AS/NZS 1571
- IIAR Bulletins
- ANSI/ASHRAE Standards
- IOR Safety code for Refrigerating Systems utilising Carbon Dioxide

Evidence Guide

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EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required

9.**2**)

Before the critical aspects of evidence are considered all

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EVIDENCE GUIDE

to demonstrate competency in this unit

prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Pressure testing, charging/discharging refrigerant/lubricants and determining the operating conditions of Carbon Dioxide vapour compression systems as described in 8) and including:

    A Selecting and using appropriate measuring devices correctly

    B Recording measurements

    C Using calculation methods accurately

    D Discharging / charging refrigerant / lubricants and pressure testing the system without damage to

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EVIDENCE GUIDE

components

E Locating and rectifying leaks

F Decontaminating and evacuating the system

G Identifying the conditions of the refrigerant (R744) at various locations in the vapour compression system in a trans-critical and sub-critical state.

H Documenting operating conditions correctly

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to servicing and repairing as well as determining the operating conditions of Carbon Dioxide vapour compression and liquid recirculation/cascade system.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining operating conditions using measurement and basic calculation methods of self contained carbon dioxide vapour compression systems, including domestic refrigerators and freezers, refrigerated cabinets and heat pump water heaters. These conditions include suction and discharge pressures, ambient, evaporator and condensed/gas cooler temperatures, evaporator, and gas cooler temperature difference, critical point, triple point and trans-critical and sub-critical refrigerant conditions of carbon dioxide (R744). Further, this unit must be demonstrated in relation to charging and discharging a Trans- critical carbon dioxide (R744) system with refrigerant and lubricant in a safe and environmentally responsible manner.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ189A Service room air conditioners

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers maintaining the effective and efficient operation of self contained room air conditioners. It encompasses working safely, applying knowledge of room air conditioners, following service manuals, testing appliance function, locating and rectifying faults and defective components and completing the necessary service documentation.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also used to augment formally acquired competencies.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where appliances are connected to fixed wiring at voltage above 50 V a.c. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for servicing air conditions. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEE010A Comply with scheduled and preventative maintenance program processes

and

UEENEEJ154A Find and rectify faults in appliance control systems and devices

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and

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Prerequisite Unit(s)

2)

Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE103A Solve problems in ELV single path circuits

or

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

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Prerequisite Unit(s) **2)**

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE103A Solve problems in ELV single path circuits

and

UEENEEJ162A Recover, pressure test, evacuate, charge and leak test refrigerants appliances

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ195A Establish the basic operating conditions of vapour compression systems - appliances

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

or

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to service room air conditioners.	1.1	OHS procedures for a given work area are identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The extent of work to be undertaken is determined from service/fault request and/or discussions with appropriate person(s).
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials/parts that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established

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ELEMENT		PERFORMANCE CRITERIA	
			procedures and checked for correct operation and safety.
2	Service room air conditioners.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Appliance is checked as being correctly isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Safety hazards resulting from the defect or fault are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Appliances are tested for efficient operation and components affecting efficiency are inspected for wear or defects in accordance with standards, manufacturer's service manuals and industry codes of practice.
		2.6	Appliance faults and their cause are identified through the application of refrigerated appliances and using measured and calculated values of appliance parameters.
		2.7	Appliance is dismantled where necessary and parts stored to protect them against loss or damage.
		2.8	Defective, worn or faulty appliance components are rechecked and their status confirmed.
		2.9	Replacement parts required to rectify defects/faults are sourced and obtained in accordance with established procedures.
		2.10	Effectiveness of the repair is tested in accordance with established procedures.
		2.11	Apparatus is reassembled, finally tested and prepared for return to service.
		2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.

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ELEMENT		PERFORMANCE CRITERIA	
		2.13	Servicing activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work area is cleaned and made safe in accordance with established procedures.
		3.3	Service report is completed and verified by an appropriate person in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and servicing room air conditioners.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

EK01-EJ189A Room air conditioners

Evidence shall show an understanding of self contained room air conditioners, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1	Types, applications, construction, components and operating characteristics
T2	Typical component wear or defects
T3	Typical faults
T4	Component repair/replacement methods
T5	Manufacturers' parts catalogues and service reports

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably

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EVIDENCE GUIDE

gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Service room air conditioners as described in 8) and including:

A Determining the nature of the work from service request

B Identifying defective components affecting appliance efficiency

C Finding faults efficiently

D Rectifying defects/faults effectively

E Testing appliance functions effectively

F Completing service report accurately

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in servicing room air conditioners.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to servicing self contained room air conditioners with any four of the following defects/faults in appliance refrigeration system in each of two different types of appliance.

- Higher energy use than previously experienced
- Not cooling/heating enough.
- Fan not operating
- Appliance noisy
- Electric shock received from appliance cabinet

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ190A Select basic commercial refrigeration system equipment, components and accessories

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

Scope

This unit covers the selection of basic commercial refrigeration system equipment and components, pipe work and controls. It encompasses the selection of the refrigerant, condensing unit, evaporator, refrigerant controls, accessories, refrigerant and condensate pipe work, and system controls based on specifications, standards and manufacturer catalogues to determine calculated and deemed-to comply solutions and documenting all selection information. It also includes predicting the refrigeration system's balance point to achieve design conditions.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training or institutional based delivery at the aligned AQF 4 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ129A	Establish heat loads for commercial refrigeration and/or air conditioning applications

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Prerequisite Unit(s) **2)**

UEENEEJ127A	Establish the thermodynamic parameters of refrigeration and air conditioning systems
UEENEEJ192A	Analyse the psychrometric performance of HVAC/R systems
and	
UEENEEJ193A	Analyse the thermodynamic performance of HVAC/R systems
or	
UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE103A	Solve problems in ELV single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ10	Install refrigerant pipe work, flow controls

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Prerequisite Unit(s)	**2)**	
	6A	and accessories
	UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
	UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
	UEENEEJ110A	Select refrigerant piping, accessories and associated controls
	UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
	UEENEEJ113A	Commission air conditioning and refrigeration systems
	UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
	UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
	UEENEEJ194A	Solve problems in low voltage refrigeration circuits
	UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
	UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
	UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
	UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to select basic commercial refrigeration system equipment and components	1.1	The extent and nature of the refrigeration installation is determined from job specifications.
		1.2	Safety and other regulatory requirements to which the refrigeration system shall comply, are identified, obtained and understood
2	Develop pipe work arrangements	2.1	The intended location of refrigeration equipment is determined from job specifications and site drawings or deemed to comply arrangements.
		2.2	Pipe work arranged to ensure safe and functional operation of the system.
		2.3	Pipe work is arranged to comply with technical standards and job specifications and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Select basic commercial refrigeration system equipment and components	3.1	Pipe and tubing is selected for suitability for the environments in which it is to be installed
	3.2	Pipe and tubing is sized to meet refrigeration parameters and capacity requirements for the refrigerant to be used.
	3.3	Pipe and tubing quantities are determined from equipment location diagrams and job specifications.
	3.4	Refrigeration system equipment and components are selected to meet load requirements based on calculated or deemed-to-comply solutions.
	3.5	Refrigerant liquid expansion valves are selected to meet functional, specified and regulatory requirements.
	3.6	Automatic control devices are selected to meet functional, specified, regulatory requirements. And current, voltage and IP ratings.
	3.7	Evidence is obtained that the selected refrigeration equipment and components comply with all requirements.
4 Document selection of system equipment and components	4.1	Reasons for selections made, including calculations, are documented in accordance with established procedures.
	4.2	Refrigeration installation arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and selecting basic commercial refrigeration system equipment and components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ190A Basic commercial refrigeration system equipment, and components and accessories selection

Evidence shall show an understanding of basic commercial refrigeration system components and piping selection, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Calculation of capacity in heat exchangers:

- Q = UA (LMTD)
- Q = mcΔt
- Q = m Δh

T2 Evaporators

- commercial types and applications
- coil bypass factor
- effects of evaporator TD on space humidity
- effects of air circulation on product conditions
- selection criteria and selection tables

T3 Condensers

- commercial types and applications
- effects of ambient conditions
- condenser control
- heat rejection factor
- condenser TD
- selection criteria and selection tables

T4 Compressors

- types and applications
- capacity

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REQUIRED SKILLS AND KNOWLEDGE

- displacement
- volume flow rate
- theoretical capacity
- total volumetric efficiency
- effect of operating conditions, including suction pressure drop and superheating
- actual capacity
- power
- theoretical requirement
- effects of operating conditions
- actual requirements
- post defrost loads
- pull down torque requirements, high, medium and low back pressure compressors
- selection tables, motor selection

T5 Refrigerant flow controls

- types, operation and applications
- effects from sub-cooling
- distributor types, operation and applications
- selection tables

T6 System load balance point

- graphical representation

T7 Line sizing and design

- quick selection tables
- velocity tables
- pressure drop in lines and fittings
- oil migration stabilisation
- refrigerant velocity
- effect of varying system capacity
- oil traps
- risers
- liquid migration

T8 Automatic controls

- fin spacing, suction temp to evaporator suction
- hot-gas bypass valves
- electronic control of valves PLC control
- refrigerant regulating valves

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REQUIRED SKILLS AND KNOWLEDGE

- solenoid valves
- condenser pressure regulating valves
- evaporator pressure regulating valves
- crankcase pressure regulating valves
- cycling controls
- pressure-stats
- thermostats,
- defrost controls
- monitoring and alarm controls
- refrigeration automation systems
- control strategies
- control modes

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take

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place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Select basic commercial refrigeration system equipment and components as described in 8) and including:

    A Arranging pipe work to comply with regulatory and functional requirements.

    B Selecting appropriate type, size and quantity of pipe and tubing

    C Selecting refrigeration equipment and components that meets load requirements

    D Selecting automatic control devices that meet functional and regulatory requirements.

    E Documenting pipe work arrangement, specification for items selected and reasons for the selections made

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in selecting refrigerant pipe/tube, accessories and associated controls.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED001B Use basic computer applications

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to the selection of basic commercial refrigeration system equipment and components, pipe work and controls for two different refrigeration systems. These include the following; refrigerant, condensing unit, evaporator, refrigerant controls, accessories, refrigerant and condensate pipe work, and system controls selection of refrigerant pipe/tube, accessories and associated controls.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ191A Select residential air conditioning system equipment, components and accessories

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

Scope

This unit covers the selection residential air conditioning equipment, pipe work, air distribution components and controls. It encompasses the selection of the unitary air conditioning equipment and components, system controls, refrigerant and condensate pipe work based on specifications, standards and manufacturer catalogues to determine calculated and deemed-to comply solutions and documenting all selection information. It also includes the selection and layout of the air distribution system and components.

Note: Residential air conditioning applications are those covered under the Building Code of Australia - Class 1A Residential Buildings.

Application of the Unit

Application of the Unit **4**)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved

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Application of the Unit **4**)

contract of training or institutional based delivery at the aligned AQF 4 level.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ129A	Establish heat loads for commercial refrigeration and/or air conditioning applications
UEENEEJ127A	Establish the thermodynamic parameters of refrigeration and air conditioning systems
UEENEEJ192A	Analyse the psychrometric performance of HVAC/R systems

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Prerequisite Unit(s) **2)**

and

UEENEEJ193A	Analyse the thermodynamic performance of HVAC/R systems
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

or

UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE103A	Solve problems in ELV single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ1	Establish the basic operating conditions of

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Prerequisite Unit(s) **2)**

04A	air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to select residential air conditioning system equipment and components	1.1	The extent and nature of the air conditioning installation is determined from job specifications.
	1.2	Safety and other regulatory requirements to which the air conditioning system shall comply, are identified, obtained and understood
2 Develop pipe work arrangements	2.1	The intended location of air conditioning equipment is determined from job specifications and site drawings or deemed to comply arrangements.
	2.2	Pipe work arranged to ensure safe and functional operation of the system.
	2.3	Pipe work is arranged to comply with technical standards and job specifications and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Select residential air conditioning system equipment and components	3.1	Pipe and tubing is selected for suitability for the environments in which it is to be installed
	3.2	Pipe and tubing is sized to meet air conditioning parameters and capacity requirements for the refrigerant to be used.
	3.3	Pipe and tubing quantities are determined from equipment location diagrams and job specifications.
	3.4	Air conditioning unitary equipment and components are selected to meet load requirements based on calculated or deemed-to-comply solutions.
	3.5	Air distribution components and controls are selected to meet functional, specified and regulatory requirements.
	3.6	Automatic control devices are selected to meet functional, specified, regulatory requirements. And current, voltage and IP ratings.
	3.7	Evidence is obtained that the selected air conditioning equipment and components comply with all requirements.
4 Document selection of system equipment and components	4.1	Reasons for selections made, including calculations, are documented in accordance with established procedures.
	4.2	Air conditioning installation arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and selecting residential air conditioning system equipment and components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ191A Air conditioning system equipment and component selection

Evidence shall show an understanding of air conditioning system equipment, components and piping selection, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Residential Air Conditioning Unitary Equipment

- Construction, operation, application and selection of:
  - room air conditioners
  - split systems – wall hang, cassettes and ducted
  - small package units
  - cooling only and reverse cycle

T2 Line sizing and design

- quick selection tables
- velocity tables
- pressure drop in lines and fittings
- oil migration stabilisation
- effect of varying system capacity
- oil traps
- liquid migration

T3 Control Systems

- Construction, operation, application and selection of:
  - cycling and safety controls
  - pressure-stats
  - thermostats,
  - de-ice controls
  - air conditioning automation systems
  - control strategies

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REQUIRED SKILLS AND KNOWLEDGE

T4 Air Distribution

- Principles
  - factors affecting the design of ductwork systems
  - flexible ductwork systems
  - static, velocity and total pressure
- Pressure loss
  - friction and dynamic
  - in ducts, friction charts
  - in fittings, loss co-efficients
  - diffuser pressure loss
- System sizing
  - standard duct sizes and gauges
  - duct selection
  - fitting selection
  - air diffuser selection
  - balancing

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the

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workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Select residential air conditioning system equipment and components as described in 8) and including:

A Arranging pipe work to comply with regulatory and functional requirements.

B Selecting appropriate type, size and quantity of pipe and tubing

C Selecting air conditioning unitary equipment and components that meets load requirements

D Selecting air distribution components and controls that meets load requirements

E Selecting automatic control devices that meet functional and regulatory requirements.

F Documenting pipe work arrangement, specification for items selected and reasons for the selections made

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in selecting refrigerant pipe/tube, accessories and associated controls.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED001B Use basic computer applications'

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to the selection of residential air conditioning equipment and components, pipe work, air distribution components and controls for two different air conditioning systems. These include the following; unitary air conditioning equipment and components, system controls, refrigerant and condensate pipe work and air distribution system and components.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the analysis of heating, ventilating, air conditioning and refrigeration (HVAC/R) systems to provide solution to psychrometric performance issues. It encompasses working safely, apply extensive knowledge of psychrometric parameters, gathering and analysing data, applying problem solving techniques, developing and documenting results and solutions for use in design work.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ193A	Analyse the thermodynamic performance of HVAC/R systems

or

UEENEEJ109A	Verify functionality and compliance of refrigeration and air conditioning installations
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE103A	Solve problems in ELV single path circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Prerequisite Unit(s) **2)**

UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110A	Select refrigerant piping, accessories and associated controls
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring

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Prerequisite Unit(s) **2)**

UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures
UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to analyse the psychrometric performance of HVAC/R	1.1	OHS processes and procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.

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ELEMENT		PERFORMANCE CRITERIA	
	systems		
		1.3	The extent of the psychrometric issues are determined from performance specifications and situation reports and in consultations with relevant persons
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
		1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2	Analyse the psychrometric performance of HVAC/R systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of psychrometric principles are applied to analytical solutions to refrigeration and air conditioning systems.
		2.3	Parameters, specifications and performance requirements in relation to refrigeration and air conditioning systems are obtained in accordance with established procedures.
		2.4	Approaches to analysing psychrometric parameters are carried out to provide the most effective solution.
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
		2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3	Document and report on the results of the psychrometric performance analysis and actions taken.	3.1	Solutions to psychrometric issues are evaluated to determine their effectiveness and modified where necessary.
		3.2	Analysis is documented including details of all findings, calculations and assumptions.
		3.3	Analysis is reported to appropriately personnel to establish appropriate action to be taken based on findings.

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ELEMENT	PERFORMANCE CRITERIA	
	3.4	Justification for findings and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and analysing the psychrometric performance of HVAC/R systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ192 A HVAC/R Psychometrics

Evidence shall show an understanding of applied psychrometrics, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Fundamentals and terms

- sensible heat factor (conditioned space and grand total)
- quantity of air
- effective surface temperature
- bypass factor

T2 Coil characteristics

- processes
- sensible cooling
- cooling, dehumidification
- sensible heating

T3 Spray processes

- saturation efficiency
- processes
- adiabatic/evaporative cooling
- cooling & humidification
- sensible cooling
- cooling and/or humidification
- chemical dehumidification process: dehumidification & heating
- cooling tower characteristics: humidification & cooling
- indirect evaporative cooling process

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REQUIRED SKILLS AND KNOWLEDGE

T4 System analysis

- partial load
- reheat control
- bypass control
- volume control
- dump back systems
- low velocity coils

T5 Psychrometric formulae and charts

- properties of air
- gas constants
- derivation of air constants
- combined gas laws
- Dalton's law of partial pressures
- Carrier's equation
- psychrometric property tables
- air mixing equations
- air quantity equations

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum,

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the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse the psychrometric performance of HVAC/R systems as described in 8) and including:

A Understanding the psychrometric performance issues

B Forming effective strategies for analysing refrigeration and air conditioning systems performance

C Obtaining psychrometric performance parameters, specifications and performance requirements appropriate to each situation.

D Evaluating the results of the analysis

E Documenting analysis details of all findings, calculations and assumptions.

F Documenting justification of actions to be implemented in accordance with professional standards.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used

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to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in analysing the psychrometric and thermodynamic performance of HVAC/R systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to analysing psychrometric parameters in at least two different refrigeration and air conditioning systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the analysis of heating, ventilating, air conditioning and refrigeration (HVAC/R) systems to provide solution to thermodynamic performance issues. It encompasses working safely, apply extensive knowledge of thermodynamic parameters, gathering and analysing data, applying problem solving techniques, developing and documenting results and solutions for use in design work.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to analyse the thermodynamic performance of HVAC/R systems	1.1	OHS processes and procedures for a given work area are identified, identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the thermodynamic issues are determined from performance specifications and situation reports and in consultations with relevant persons
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
		1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2	Analyse the thermodynamic performance of HVAC/R systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of thermodynamic principles are applied to analytical solutions to refrigeration and air conditioning systems.
		2.3	Parameters, specifications and performance requirements in relation to refrigeration and air conditioning systems are obtained in accordance with established procedures.
		2.4	Approaches to analysing thermodynamic parameters are carried out to provide the most effective solution.
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
		2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards

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ELEMENT		PERFORMANCE CRITERIA	
3	Document and report on the results of the thermodynamic performance analysis and actions taken.	3.1	Solutions to thermodynamic issues are evaluated to determine their effectiveness and modified where necessary.
		3.2	Analysis is documented including details of all findings, calculations and assumptions.
		3.3	Analysis is reported to appropriately personnel to establish appropriate action to be taken based on findings.
		3.4	Justification for findings and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with professional standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and analysing the thermodynamic performance of HVAC/R systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ193A Refrigeration systems

Evidence shall show an understanding of introduction to refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Major components, type and functions:

- evaporators
- compressors
- expansion devices
- ancillary components
- refrigerants

T2. System operation and performance:

- thermodynamic properties of refrigerants
- pressure enthalpy charts
- refrigerant cycle
- refrigerant cycle represented on pH charts
- introduction to refrigerating effect, heat of compression, heat rejected on high side, co-efficient of performance, liquid sub-cooling suction superheating
- effects on performance of changing operating pressures, liquid sub-cooling, suction superheating

T3. Application of refrigeration:

- introduction to industrial refrigeration, specific system component types and refrigerants applied.
- scope of commercial refrigeration, specific system component types and refrigerants applied

T4. Refrigerated enclosures and cabinets:

- merchandising and display cabinets:
- deep freeze meat

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REQUIRED SKILLS AND KNOWLEDGE

- dairy
- fruit and vegetable
- multi-deck display
- single deck
- well type
- island cases
- glass door
- reach door
- reach in merchandisers
- defrosting methods
- cold rooms and freezer rooms
- types and construction
- insulation
- vapour barrier
- frost heave
- interior fittings
- location of equipment
- defrosting methods
- cold tracking
- trace heating
- storage conditions
- temperature
- relative humidity
- air velocity
- air patterns
- load limits

KS02-EJ193A Air conditioning systems

Evidence shall show an understanding of introduction to air conditioning systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Occupational health requirements:

- WH&S requirements
- BCA requirements
- AS1668 parts 1 & 2
- AS3666
- noise and vibration
- air quality
- sick building syndrome

T2. Operating requirements:

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REQUIRED SKILLS AND KNOWLEDGE

- ventilation
- air distribution
- terminal velocity
- temperature
- relative humidity
- air quality
- noise
- basic psychrometrics

T3. Operating modes

- ventilation
- evaporative cooling
- ventilation and cooling
- ventilation and heating
- dehumidification
- dehumidification
- dehumidification and reheat
- humidification

T4. Operating terminology/characteristics:

- throw, drop
- primary and secondary air
- coanda effect

T5. HVAC system components and functions:

- fans
- ducting
- registers
- dampers
- filters
- cooling coils
- heating coils
- induction units
- fan coil units
- terminal units
- humidifiers, pumps and sprayers
- hydronic systems and components

T6. Applications and construction of air conditioning systems:

- applications
- residential, commercial, low and high rise, industrial ventilation and air conditioning

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REQUIRED SKILLS AND KNOWLEDGE

- packaged plant
- RACs, split systems (wall and floor console, ceiling fan coil), wall facia, roof top, reverse cycle option central station plant
- all air systems, constant volume variable temperature, constant temperature variable volume, air/water systems
- all water system, multi-zoning, thermal storage systems
- basic air conditioning system diagrams
- duct layout
- hydronic layout
- unit/conditioner drawings

T7. HVAC control systems:

- basic principles
- terminology
- symbols and diagrams
- basic applications

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry

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and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse the thermodynamic performance of HVAC/R systems as described in 8) and including:

A Understanding the thermodynamic performance issues

B Forming effective strategies for analysing refrigeration and air conditioning systems performance

C Obtaining thermodynamic performance parameters, specifications and performance requirements appropriate to each situation.

D Evaluating the results of the analysis

E Documenting analysis details of all findings, calculations and assumptions.

F Documenting justification of actions to be implemented in accordance with professional standards.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with

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the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in analysing the psychrometric and thermodynamic performance of HVAC/R systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

There are no concurrent assessment recommendations for this

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other units unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to analysing thermodynamic parameters in at least two different refrigeration and air conditioning systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ194A Solve problems in low voltage refrigeration circuits

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	
4	Update		Update unit in Concurrent Assessment UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers determining correct operation of low voltage d.c. and a.c. circuits and providing solutions as they apply to refrigeration work functions. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in single and multiple path circuits.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

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Application of the Unit 4)

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V a.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE103A	Solve problems in ELV single path circuits

and

UEENEEJ103A	Establish the basic operating conditions of vapour compression systems

and

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

or

UEENEEJ195A	Establish the basic operating conditions of vapour compression systems - appliances

and

UEENEEE1	Apply Occupational Health and Safety

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Prerequisite Unit(s) **2)**

01A	regulations, codes and practices in the workplace

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on low voltage refrigeration circuits.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve problems in low voltage refrigeration circuits.	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Established methods are used to solve d.c. and a.c. circuit problems from measure and calculated values as they apply to single and multiple path electrical circuits.
		2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.6	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve circuit problems is documented.
		3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in multiple path a.c. circuits.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ194 A Low voltage refrigeration circuits

Evidence shall show an understanding of low voltage d.c. and a.c single and multiple path applied to refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Resistance Measurement

- Typical field instruments and applications
- Insulation resistance tester
- IR Tester parts and functions
- Continuity testing
- Insulation resistance testing
- IR Tester voltage ranges
- AS/NZS 3000 wiring rules
- Calibration of IR Testers
- Storage of IR Testers
- Using of testers for continuity and insulation resistance measurement
- Calculation of resistance from measured results

T2 Factors affecting resistance

- Factors
- Resistivity
- Change in length
- Change in cross sectional area (csa)
- Change in temperature
- PTC and NTC
- Influence on practical circuits

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REQUIRED SKILLS AND KNOWLEDGE

- Measurement of resistance

T3 Voltage and current measurement

- Hazards
- Characteristics of instruments
- Reading scales
- Voltmeters
  - Characteristics
  - Types
  - Operation
  - Connection
  - Loading effect
  - Advantages and disadvantages
  - Selection
- Ammeters
  - Characteristics
  - Types, series-ammeter and tong-ammeter
  - Operation
  - Connection
  - Advantages and disadvantages
  - Selection

T4 Direct Current parallel circuits

- Parallel circuits
- Parallel circuit components
- Applications of parallel circuits
- Characteristics
- Calculation of parallel circuit parameters
- Circuit connections
- Measurements of R, V, I in parallel circuits
- Determine V, I, R, P

T5 Direct Current series / parallel circuits

- Series/Parallel circuits
- Series/Parallel circuit components
- Applications of series/parallel circuits
- Characteristics
- Bridge network
- Calculation of series/parallel circuit parameters

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REQUIRED SKILLS AND KNOWLEDGE

- Connection of series/parallel circuits
- Measurements of R, V, I in series/parallel circuits
- Determine V, I, R, P

T6 Capacitors and Capacitance

- Capacitor construction
- Dielectric material
- Types of capacitors
- Circuit symbols
- Capacitor terms
- Units
- Factors affecting capacitance
- Capacitor charge
- RC d.c series circuit
- Time constants
- Connection of capacitors

T7 Capacitors in Series and Parallel

- Capacitor hazards
- Safe handling of capacitors
- Dangers of discharging capacitors
- Series connections
- Parallel connections
- Measuring / testing of capacitors
- Capacitor faults
- Applications of capacitors
- Calculation of total capacitance
- Series and parallel connections
- Testing capacitors for serviceability

T8 Electromagnetic induction

- Faraday’s law
- Applications
- Inductance

T9 Single phase alternating current

- Generation of a sinusoidal waveform
- Sinusoidal waveform characteristics
- Measuring and calculating values of a sinusoidal waveform
- Generation of single phase alternating current

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REQUIRED SKILLS AND KNOWLEDGE

- Voltage and current in resistive, inductive and capacitive circuits
- Ohms Law and Impedance
- Power
  - power in a single phase circuit
  - power factor and phase angle
  - methods used to measure single phase power, energy and power factor
  - single phase power measurement
  - effects of low power factor
  - power factor improvement requirements
  - power factor improvement methods
  - wiring rules and regulations

T10 Magnetic devices

- Relays
- Contactors
- Solenoids
- Transformers
- Single & double wound.
- Volts vs. Turns ratio.
- Losses:
- VA in vs. VA out.
- Control transformers
- Power and motor starting transformers.
- Safety.
- Magnetic sensing devices

T11 Three phase alternating current

- Advantage of three phase system
- Generation of three phase
- Relationship between generated voltages
- Phase sequence
- Three phase star-connections
- Star connections
- Line and phase voltages and currents
- Three phase four wire systems
  - function of the neutral conductor
- Three phase delta-connections
  - Delta connections
  - Line and phase voltages and currents

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REQUIRED SKILLS AND KNOWLEDGE

T12 Circuit protection and isolation

- Harmful effects of:
  - direct contact
  - indirect contact
  - thermal effects
  - over current
  - faults
  - mechanical movement
- Earthing
  - earthing terms
  - minimum earthing conductor size
  - MEM system
  - AS/NZS 3000 requirements
- Circuit protection devices
  - purpose, types, operating principles, characteristics and applications, including rewireable fuses, HRC fuses, circuit breakers, residual current devices and overvoltage and under voltage protection devices.
  - circuit protection and load protection
  - AS/NZS 3000 requirements (including sanger tags, & switch locking)
  - discrimination of circuit protection devices.
- Isolation devices
  - requirements for provision of isolation
  - need for protection against mechanical movement
  - AS/NZS 3000 requirements

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to

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EVIDENCE GUIDE

assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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EVIDENCE GUIDE

shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in single and multiple path d.c. and a.c. circuits as described in 8) and including:

A Determining the operating parameters of an existing circuit.

B Alternating an existing circuit to comply with specified operating parameters.

C Developing circuits to comply with a specified function and operating parameters.

D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in multiple path a.c. circuits.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE103A Solve problems in ELV single path circuits

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- Single source series, parallel and series-parallel d.c and a.c. circuits as they apply to problems related to installation, fault finding, maintenance or development work functions in Refrigeration, Air Conditioning and Appliance Servicing disciplines.
- In relation to at least two of the following types of circuit problems and on at least two occasions
  - determining the operating parameters of an existing circuit
  - alternating an existing circuit to comply with specified operating parameters
  - developing circuits to comply with a specified function and operating parameters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	5

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning

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UEENEEJ195A Establish the basic operating conditions of vapour compression systems - appliances

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the determination of the operating conditions of vapour compression systems of self contained refrigerated appliances. It encompasses working safely, determining refrigerant pressures and temperatures and relevant air temperatures using measurement and basic calculation methods.

Application of the Unit

Application of the Unit **4**)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

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Application of the Unit

4)

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills	**3**)
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to determine the basic operating conditions of appliance vapour compression systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	Expected operating conditions are obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others
	1.6	Sources of materials that may be required for the

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ELEMENT		PERFORMANCE CRITERIA	
			work are identified and accessed in accordance with established routines and procedures
		1.7	Tools, equipment and testing devices needed to determine the basic operating conditions of appliances are obtained and checked for correct operation and safety
2	Determine the basic operating conditions of appliance vapour compression systems	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
		2.2	Measuring system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
		2.3	System is checked and isolated where necessary, in strict accordance OHS requirements and procedures
		2.4	Established procedures are used to determine actual and specified range of operating conditions from measured and calculated values as they apply to appliance vapour compression systems.
		2.5	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person
		2.7	Operating conditions are determined without damage to of appliance, circuits, the surrounding environment or services and using sustainable energy practices
3	Complete work and report	3.1	OHS work completion risk control measures and procedures are followed
		3.2	Work site and equipment is cleaned and made safe in accordance with established procedures
		3.3	Operation conditions are documented, including identification of any parameter that is not within the specified range for the system

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Work supervisor is notified of the completion of the work in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and determining the basic operating conditions of vapour compression systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ195A Basic operating conditions of vapour compression systems - appliances

Evidence shall show an understanding of basic operating conditions of vapour compression systems used in refrigerated appliances, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Domestic refrigeration industry

- The history of the domestic refrigeration industry
- Applications, classifications and equipment used

T2 Introduction to the Vapour Compression System

- Basic Operation
- Major Components

T3 Heat

- Matter (atoms, molecules, energy and its different forms)
- Heat energy (definition, unit of measurement)
- Enthalpy (definition, unit of measurement)
- Heat flow (hot to cold)
- Heat transfer
  - methods (conduction, convection, radiation)
  - requirements
  - effects

T4 Temperature and relative humidity

- Temperature
- Scale types (imperial, metric, absolute) and their units of measurement
- Conversion to/from absolute values

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REQUIRED SKILLS AND KNOWLEDGE

- Temperature difference/change (td, Δt, unit of measurement)
- Relative humidity
- Thermometer types and applications (digital, stem, dial, max/min, non-contact, data loggers)
- Relative Humidity measurement devices and applications (dry bulb/wet bulb, sling, digital)
- Hazards and related safe working practices (working near rotating machinery - fans, etc)
- Care and maintenance (bending stems, overheating, removing batteries after use, uncoiling capillary)
- Calibration (boiling water, iced water, send to a specialist etc)
- Appropriate and safe methods of use
- Typical locations on a system
- Fitting temperature and relative humidity instruments

T5 Sensible and Latent Heat

- Definition of specific heat capacity, latent heat and sensible heat (including units of measurement)
- Types of latent heat
- Heat calculations

T6 Pressure

- Pressure
- Scale types (imperial, metric, absolute) and their units of measurement
- Vacuum scales (Pascals, microns)
- Conversion to/from absolute values
- The basic Gas Laws – Boyles, Charles and Daltons (excl combined or general gas law)
- Pressure gauge types and applications (pressure, compound, vacuum, manometer, magnehelic, barometer)
- Hazards and related safe working practices (dangerous system pressures)
- Care and maintenance (ingress of oil and contaminants (dirt), avoiding needle bounce (esp. HP) etc)
- Calibration (atmospheric pressure, send to a specialist etc)
- Appropriate and safe methods of use
- Typical locations

T7 Refrigerant conditions

- Saturation temperature
- Saturated liquid / saturated vapour
- Superheated vapour

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REQUIRED SKILLS AND KNOWLEDGE

- Sub-cooled liquid
- Pressure temperature relationships
- P/T charts
- Enthalpy

T8 The vapour compression cycle

- Primary system components
- High and low pressure sides
- Basic system operation

T9 Working safely with refrigeration vapour compression systems

- Risk management principles and processes
- Hazards and risk control measures associated with:
  - refrigeration vapour compression systems and components
  - refrigerants
  - measuring and testing equipment

T10 Leak detectors

- Detector types and applications (electronic, halide, bubble, ultra violet)
- Hazards and related safe working practices (working around rotating machinery, open flame, ultra violet light etc)
- Care and maintenance (delicate electronic equipment, changing sensor tip filters, changing gas cartridges etc)
- Calibration (auto calibrating , send to a specialist etc)
- Leak detection procedures

T11 Service gauges

- Service Gauges
  - Types (dial gauges or electronic, manifolds with additional vacuum and charging ports & sight glasses)
  - Typical uses for service gauges (high & low side pressure readings, charging, evacuating)
  - Care and maintenance (oil and contaminants (dirt) in hoses, avoiding needle bounce, changing hose seals)
  - Calibration (hoses open to atmosphere, adjusting screw etc)
  - Hose shut-off valves and adaptors (access control valves, kwik couplers, Hansen lines etc)
- System Access Fittings
  - Types (Schrader, piercing, etc)
  - Typical applications for each
  - Hazards and related safe working practices (oil or liquid spray, keeping

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REQUIRED SKILLS AND KNOWLEDGE

clean, leaks etc)

- Care and maintenance (gland nuts loosened/tightened, seal caps fitted, regulations on piercing valves)

- Using Service Gauges
  - Service gauge manifold hose fitting
  - Purging
  - Pressure readings
  - Service gauge manifold hose removal
  - Pressure to temperature conversion

T12 Refrigeration Compressors

- Function of the compressor
- Compressor style (hermetic)
- Types, construction and their applications (reciprocating, rotary, scroll)
- Basic types of compressor oil (Mineral, Polyolester (POE), Alkyl Benzene, Polyalkylene Glycols (PAG)) (brief overview)
- Methods of lubrication (splash, forced)
- Safe handling (MSDS - POE's, PAG's, Mineral, AB's - Residual acid's in used oil)

T13 Condensers and related components

- Function of the condenser
- Types, construction and their applications (static, forced draught)

T14 Evaporators and related components

- Function of the evaporator
- Evaporator styles (direct expansion)
- Types, construction and their applications (static, forced draught)
- Refrigerant/air flow paths (forced/induced draft, parallel/counter flow)

T15 Common Refrigerant Metering Devices

- Function of a refrigerant metering device
- Overview of common types and their applications (capillary tube and restrictor)

T16 Basic Operating Conditions

- Ambient conditions
- Common climate values (highest max temp, lowest min temp, mean daily temp, mean highest/lowest)
- Typical climates for various common localities
- Evaporator Td

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REQUIRED SKILLS AND KNOWLEDGE

- Effect of changes in Evap. Td and typical industry reference values for forced draught and static coils
- Condenser Td
- Effect of changes in Cond. Td and typical industry reference values for forced draught and static coils
- Typical storage conditions (temp & RH)
- Typical high and low side system operating values (pressures and temperatures allowing 1K equivalent PD)

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material

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EVIDENCE GUIDE

carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Determine the basic operating conditions of refrigerated appliance vapour compression systems as described in 8) and including:

    A Selecting and using appropriate measuring devices correctly

    B Recording measurements

    C Using calculation methods accurately

    D Identifying the conditions of a refrigerant at various locations in the appliance vapour compression system

    E Documenting operating conditions correctly

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in determining the basic operating conditions of vapour compression systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to determining operating conditions using measurement and basic calculation methods of vapour compression systems in refrigerated appliances. These conditions include suction and discharge pressures, ambient, evaporator and condensing temperatures, evaporator, and condenser temperature difference.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEJ196A Operate Ammonia Refrigeration Plant

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers specialised procedures for operating an industrial refrigeration plant using ammonia as the refrigerant. It encompasses applying specialised knowledge of refrigeration principles that apply to ammonia, specifying the normal operating parameters for the plant, rectifying faults and defective components within organisational guidelines and completing the necessary service documentation.

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Application of the Unit

Application of the Unit 4)

This competency standard is suitable for refrigeration plant operators who need to be aware of the potential hazards associated with ammonia and the appropriate course of action that should be taken in an emergency.

Currently delivered as a stand alone unit of competency and is open to any person whose work requires them to operate ammonia refrigeration plant.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note :
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training

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1.2) License to practice

such as apprenticeships.

Note.
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed

UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to operate Ammonia refrigerant plant	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2	Refrigeration systems and components on which the work is to be carried out are identified.
	1.3	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.4	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.5	The nature of work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.6	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.

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ELEMENT	PERFORMANCE CRITERIA	
	1.7	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
	1.8	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
	1.9	The refrigeration system's required operating conditions are established from documentation/supervisor and the application of refrigeration fundamentals
2 Operate Ammonia refrigeration plant	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Refrigeration plant is started up in accordance with established procedures, standard, codes and regulations
	2.3	Measuring refrigeration system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
	2.4	Supervisor or person in charge is advised of system and components performing outside their operating parameters to facilitate remedial action.
	2.5	Remedial action is implemented within the organisation's procedures.
	2.6	Service procedures are completed according to identified organisational procedures according to SOPs.
	2.7	Daily processing requirements are ascertained to predict demand on refrigeration plant.
	2.8	Oral and written information on the performance of the plant is exchanged formally and informally between the operator and supervisor/production team.

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ELEMENT	PERFORMANCE CRITERIA	
	2.9	Equipment controls are adjusted to prepare plant to meet the load.
	2.10	Action is taken in a proactive way to maintain the performance of the plant.
	2.11	Demands on plant consumables are calculated to facilitate the ordering of replacements.
	2.12	Strategies are developed to meet demand in the event of equipment malfunction or breakdown.
3 Complete work and report on operating Ammonia refrigeration plant	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Plant performance records are maintained and distributed to meet organisational standards.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of refrigeration plant using ammonia as the refrigeration medium safe working practices and operation.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ196A Ammonia refrigeration system operation

Evidence shall show an understanding of refrigeration principles, Ammonia refrigeration systems, their operating conditions, and starting up and shut down procedures, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Introduction to the Vapour Compression System

- Basic Operation
- Major Components

T2 Heat

- Heat energy (definition, unit of measurement)
- Enthalpy (definition, unit of measurement)
- Heat flow (hot to cold)
- Heat transfer
  - methods (conduction, convection, radiation)
  - requirements
  - effects

T3 Temperature and relative humidity

- Temperature
  - Scale types (imperial, metric, absolute) and their units of measurement
  - Conversion to/from absolute values
  - Temperature difference/change (td, Δt, unit of measurement)
- Relative humidity
- Thermometer types and applications (digital, stem, dial, max/min, non-contact, data loggers)
- Relative Humidity measurement devices and applications (dry bulb/wet bulb, sling, digital)

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REQUIRED SKILLS AND KNOWLEDGE

- Hazards and related safe working practices (working near rotating machinery - fans, pulleys, belts etc)
- Care and maintenance (bending stems, overheating, removing batteries after use, uncoiling capillary)
- Calibration (boiling water, iced water, send to a specialist etc)
- Appropriate and safe methods of use
- Typical locations on a system
- Fitting temperature and relative humidity instruments

T4 Sensible and Latent Heat

- Definition of latent heat and sensible heat (including units of measurement)
- Types of latent heat

T5 Pressure

- Pressure
  - Scale types (imperial, metric, absolute) and their units of measurement
  - Vacuum scales (Pascals, microns)
  - Conversion to/from absolute values
- The basic Gas Laws – Boyles, Charles and Daltons (excl combined or general gas law)
- Pressure gauge types and applications (pressure, compound, vacuum, manometer, magnehelic, barometer)
  - Hazards and related safe working practices (dangerous system pressures)
  - Care and maintenance (ingress of oil and contaminants (dirt), avoiding needle bounce (esp. HP) etc)
  - Calibration (atmospheric pressure, send to a specialist etc)
  - Appropriate and safe methods of use
  - Typical locations

T6 Refrigerant conditions

- Saturation temperature
- Saturated liquid / saturated vapour
- Superheated vapour
- Sub-cooled liquid
- Pressure temperature relationships
- P/T charts
- Enthalpy

T7 The vapour compression cycle

- Primary system components
- High and low pressure sides

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REQUIRED SKILLS AND KNOWLEDGE

- Basic system operation

T8 Working safely with refrigeration vapour compression systems

- Risk management principles and processes
- Hazards and risk control measures associated with:
  - refrigeration vapour compression systems and components
  - refrigerants
  - measuring and testing equipment

T9 Ammonia Refrigeration Systems

- Vapour Compression Systems
  - Revision of Vapour Compression Cycle
  - Properties of Ammonia
  - Safe Handling of Ammonia
- Types of Ammonia Systems
  - Direct Expansion Systems
  - Flooded Systems
  - Liquid Recirculation Systems
- Multi Staged Systems
  - Single Staged Systems
  - Multi Staged Systems
  - Cascade Systems

T10 Operating conditions of Ammonia Refrigeration Systems

- Compressors
  - Function of the compressor
  - Types, construction and their applications
  - Capacity control of compressors
  - Factors affecting performance
  - Economiser operation
  - Types of oil separators
  - Methods of oil cooling
  - Operation and maintenance
- Lubrication and lubricants
  - Lubrication methods
  - Safe handling of lubricants
  - Selection of lubricants
  - Oil / Ammonia separation
  - Adding and removing oil from Ammonia systems

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REQUIRED SKILLS AND KNOWLEDGE

    - Methods of oil recovery
- Evaporators / Cooling Units
    - Types of evaporators (air / fluid cooling)
    - Direct contact freezing
    - Secondary refrigerants
    - Evaporator defrost methods and controls
    - Operation and maintenance
- Condensers and high pressure receivers
    - Evaporative condensers
    - Water cooled condensers
    - Air cooled condensers
    - High pressure receivers
    - Operation and maintenance
- Low Pressure Receivers
    - Suction accumulators
    - Intercoolers
    - Liquid refrigerant pumps
    - Liquid level controls
    - Operation and maintenance
- Purging
    - Non condensable gases
    - Manual; purging of Ammonia systems
    - Automatic refrigerated purgers
    - Operation and maintenance
- Refrigerant Flow Devices
    - Expansion valves
    - Automatic liquid feed control devices
    - Pressure regulating devices
    - Operation and maintenance
    - Methods of oil recovery
- Ancillary Components
    - Strainers, isolating valves
    - Liquid level indicators
    - Pressure relief valves
    - Ammonia leak detectors
    - Safety controls
    - Operation and maintenance
    - Leak detector types and applications

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REQUIRED SKILLS AND KNOWLEDGE

- Hazards and related safe working practices
- Care and maintenance
- Leak detection procedures
- Charging refrigerant into system
- Routine maintenance procedures
  - Draining and adding oil
  - Charging system
  - Purging condensable gases
  - Leak testing
  - Checking drives, bearings, couplings, pulleys, V-belts etc.
- Fault finding
  - Identify faults that affect the safe operation of the plant
- Controlling and addresses faults
  - Limiting the affect of the fault on the safe operation of the fault
  - Organising correction action to repair the fault

T11 System start up and shut down procedures

T12 Emergency procedures

T13 Maintenance and servicing procedures

- Leak Testing

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships.

However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Operating an industrial refrigeration plant using ammonia as the refrigerant, determining plant operating conditions, rectifying faults and defective components within organisational guidelines and completing the necessary service documentation.
  -

A Starting up Ammonia refrigerant plant

B.Selecting and using appropriate measuring devices correctly

C Recording measurements

D Using calculation methods accurately

E Identifying the conditions of the refrigerant (R717) at various

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EVIDENCE GUIDE

locations in the vapour compression and liquid recirculation system.

F Taking remedial action within organisational procedures and job role

-

G Documenting operating conditions correctly

H. Conducting servicing procedures according to the schedule, including the inspection of all lagging, insulation, pipe and duct mountings

I. Shutting down Ammonia refrigerant plant

J. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in operating and servicing ammonia refrigeration plant in a safe manner following organisational procedures.

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EVIDENCE GUIDE

Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ178A Apply safety awareness and legal requirements for ammonia refrigerant

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to Ammonia refrigeration systems and include starting up, determining operating conditions using measurement and basic calculation methods, basic repairs and shutting down the system. These conditions include suction, inter-stage and discharge pressures, ambient, evaporator, inter-stage and condensing temperatures, evaporator, and condenser temperature difference.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales.

Reading	2	Writing	2	Numeracy	2

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning

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UEENEEK101A Maintain safety and tidiness of remote area power supply systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers maintaining safety of remote area power supply (RAPS) system by ensuring that only RAPS equipment is present and is in its allotted place and that the system is free of litter. It encompasses working safely, regularly checking systems, cleaning techniques and reporting safety issues.

Application of the Unit

Application of the Unit **2)**

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEK102A	Work safely with remote area power supply systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to maintain safety and tidiness of RAPS system	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature and location of the RAPS system is obtained from work schedule and supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with fellow workers and the local community.
	1.6	Tools and equipment needed to carry out the cleaning work are obtained and checked for correct operation and safety
2 Maintain safety and tidiness of RAPS system	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/system are checked as being isolated where necessary in strict accordance

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ELEMENT	PERFORMANCE CRITERIA	
		OHS requirements and procedures.
	2.4	Routine procedures are used to clean RAPS system and area.
	2.5	Cleaning is carried out efficiently without waste of materials and energy or damage to apparatus, circuits, the surrounding environment or services.
	2.6	Routine quality checks are carried out in accordance with work instructions.
3 Complete work and report	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Procedures for referring cleaning and tidiness issues to the local community are followed.
	3.3	Completion of cleaning work and issues are reported to work supervisor in accordance with established routines.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and maintaining safety and tidiness of remote area power supply (RAPS) systems

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK101A RAPS plant area cleaning

Evidence shall show an understanding of cleaning and maintaining remote area power supply (RAPS) systems to an extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

- Needs for a clean and tidy plant area
- RAPS system components and associated equipment and their location within the plant area
- manual fuel pump if available
- Plant cleaning techniques:
  - Fuel and oil
  - acid spills;
  - removal of dust, insects, spiders, animals
  - removal of non-RAPS equipment
- Technique for reporting and dealing with cleaning issues.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

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access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a

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percentile graded result for the purpose of regulatory or licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain safety and tidiness of remote area power supply systems as described in 8) and including:

A	Removing non-RAPS equipment
B	Safely removing insects, spiders and any animals
C	Safely removing dust and dirt from floors and equipment
D	Identifying and reporting at least two safety issues
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to maintaining safety and tidiness of remote area power supply systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5) There are no concurrent assessment recommendations for this unit.

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with units UEENEEE101A Apply Occupational Health Safety regulations, codes and practices in the workplace

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to least two different RAPS systems incorporating a battery bank and at least two of the following:

- Generator set
- Photo voltaic array
- RAP system
- Wind generator

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK102A Work safely with remote area power supply systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers safety practices for working on remote area power supply (RAPS) systems. It encompasses identifying safety hazards, using risks control measures and following routine procedures for prescribed system maintenance.

Note:
Components of this unit are included in the critical aspects of evidence in each applicable unit to ensure that OHS practices are demonstrated as they apply to RAPS system servicing work functions and situations

Application of the Unit

Application of the Unit **2)**

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to enter a RAPS system	1.1	Instruction in hazards and risk control measures for RAPS systems maintenance are identified, obtained and understood.
		1.2	System access permit is obtained from work supervisor.
		1.3.	Preparations for electrical and non-electrical isolation are made to prevent creation of hazards
		1.4	Tools and equipment needed for the work are checked for safety and correct functionality according to established safety routines.
2	Apply safe working practices in RAPS system area.	2.1	Workplace procedures and work instructions for controlling risk are followed accurately.
		2.2	Workplace procedures for dealing safe working practices in RAPS system are followed according to prescribed work procedures.
		2.3	Circuits/machines/system are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Routine procedures are used to apply safe working practices in RAPS system and area.
		2.5	Safe working practices are carried out efficiently without waste of materials and energy or damage to apparatus, circuits, the surrounding environment or services.
		2.6	Routine quality checks are carried out in accordance with work instructions.

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ELEMENT	PERFORMANCE CRITERIA	
3. Follow workplace procedures for hazard identification and risk control in RAPS system areas	3.1	Hazards are identified and prescribed control measures implemented and monitored through active participation in the consultation process with employer, other employees and local community.
	3.2	Hazards in the work are recognised and reported to work supervisor personnel according to established procedures.
	3.3	OHS records of incidents are completed in accordance with regulatory requirements and established procedures
	3.4	Workplace instructions and training are followed accurately within established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and working safely with remote area power supply (RAPS) systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK102A Remote area power supply safe working practice

Evidence shall show an understanding of RAPS safe working practices to an extent indicated by the following aspects:

General safety encompassing:

- General safety
- Risk assessment
- Personal protective equipment
- OHS procedures

RAPS safety and risk assessment encompassing:

- Types of hazards in and around remote area power supplies

Note: In addition to the safety hazards found in most workplace RAPS systems are likely to have the hazards related to electricity

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REQUIRED SKILLS AND KNOWLEDGE

supplied from more than one source, rotating machines, fuels and oils, exhaust fumes, and acids and flammable gases from batteries.

- Measures for dealing with hazards in and around remote area power supplies
- Purpose and methods for isolation and de-energisation of power supplies

Correct isolation and de-energisation procedures encompassing:

- Processes for preventing generator from automatically starting
- Isolating photo voltaic arrays,
- Isolating wind driven generators,
- Isolating battery
- Isolating inverter power sources

Safety signage encompassing:

- Types of signs
- Location
- Condition
- Suitability

Access to system encompassing:

- Methods for limiting access to plant areas

Reporting

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Work safely with remote area power supply (RAPS) systems as described in 8) and including:

A Preparing to enter the RAPS system including, permission to enter the area and to isolate RAPS equipment

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B	Applying work procedures and instructions as they apply to risk control measures
C	Dealing with accidents and emergencies
D	Participating in consultation processes, identifying hazards and implementing and monitoring control measures
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to working safely with remote area power supply (RAPS) systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

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Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence development in this unit may be arranged concurrently with other units in a qualification or possible skill clusters in which this unit is included.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to least two different RAPS systems incorporating a battery bank, a generator set and a photo voltaic array and at least one similar RAPS system with the additions of a wind generator.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK103A Conduct periodic maintenance of remote area power supply battery banks

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers maintenance of remote area power supply (RAPS) battery banks where the exposed voltage is not greater than 50 V a.c. or 120 V d.c. It encompasses working safely and to maintenance standards and following maintenance routines, identifying known types of battery faults using routine procedures and completing the necessary maintenance reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEK102A	Work safely with remote area power supply systems
UEENEEE131A	Solve problems in ELV circuits for non electrical workers

OR

UEENEEE104A	Solve problems in d.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct periodic maintenance of battery banks	1.1	OHS procedures for a RAPS plant are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	The nature and location of RAPS system is identified from documentation or from work supervisor to establish the scope of work to be undertaken
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

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ELEMENT		PERFORMANCE CRITERIA	
			fellow workers and the local community
		1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Maintain RAPS systems battery banks.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Prescribed maintenance procedures are used to test and check RAPS system battery banks
		2.5	Battery bank maintenance, including performance measurements and repairs are carried out safely and to prescribed routines and procedures
		2.6	Known types of battery functional faults are identified using routine fault finding procedures
		2.7	Procedures are followed for referring non-routine events to immediate supervisor for directions
		2.8	Maintenance and repair work is carried out efficiently without waste of materials and energy and without damage to apparatus, circuits, the surrounding environment or services
		2.9	Routine quality checks are carried out in accordance with work instructions

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete maintenance work on battery banks and report.	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with routine procedures
	3.3	Procedures for referring local maintenance issues to the community are followed
	3.4	Battery bank performance measurements are reported to the work supervisor through the established maintenance reporting procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and conducting periodic maintenance of remote area power supply (RAPS) battery banks.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK103A **RAPS systems battery bank maintenance techniques**

Evidence shall show an understanding of maintaining RAPS battery systems to an extent indicated by the following aspects:

T1 Basic battery maintenance encompassing:

- scope of regular testing, checking and corrective actions
- measurement of specific gravity and voltages of battery cells;
- checking and topping up electrolyte levels;
- checking for acid leakage, cracks in battery casing, corrosion of battery terminals and connections,
- cleaning of terminal connections and treating with an anticorrosive

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct periodic maintenance of remote area power supply (RAPS) battery banks as described in 8) and including:

A Measuring and recording specific gravity of electrolyte

B Measuring and recording cell voltages

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C	Visual inspecting of batteries for low electrolyte levels; electrolyte leakage corroded terminals and connections
D	Topping up low electrolyte levels
E	Identifying electrolyte leaks
F	Cleaning corroded terminals and connections and treating with an anticorrosive
G	Reporting all maintenance activities
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting periodic maintenance of remote

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area power supply (RAPS) battery banks.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets
UEENEEK105A	Conduct periodic maintenance of remote area power supply photo voltaic arrays
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to least two different RAPS systems in which the battery bank is charged from a generator set and a photo voltaic array and at least one similar RAPS system where the battery bank is charged form a wind generator.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK104A Conduct periodic maintenance of remote area power supply generator sets

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Show full pre-req chain in the unit	

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers maintenance of remote area power supply (RAPS) generator sets where the exposed voltage is not greater than 50 V a.c. or 120 V d.c. It encompasses working safely and to maintenance standards and following maintenance routines, identifying known types of generator faults using routine procedures and completing the necessary maintenance reporting

Application of the Unit

Application of the Unit **2)**

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not

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License to practice **3)**

require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEK102A	Work safely with remote area power supply systems
UEENEEE131A	Solve problems in ELV circuits for non electrical workers

OR

UEENEEE104A	Solve problems in d.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct periodic maintenance on generator sets	1.1	OHS procedures for a RAPS plant are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	The nature and location of RAPS system is identified from documentation or from work

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ELEMENT	PERFORMANCE CRITERIA	
		supervisor to establish the scope of work to be undertaken
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with fellow workers and the local community
	1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Maintain RAPS systems generator sets	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Prescribed maintenance procedures are used to test and check RAPS system generator sets
	2.5	Generator set maintenance, including performance measurements and repairs, are carried out safely and to prescribed routines and procedures
	2.6	Known types of generator set functional faults are identified using routine fault finding procedures
	2.7	Procedures are followed for referring non-routine events to immediate supervisor for directions
	2.8	Maintenance and repair work is carried out efficiently without waste of materials and energy and without damage to apparatus, circuits, the

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ELEMENT	PERFORMANCE CRITERIA	
		surrounding environment or services
	2.9	Routine quality checks are carried out in accordance with work instructions.
3 Complete maintenance work of generator sets and report	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with routine procedures
	3.3	Procedures for referring local maintenance issues to the community are followed
	3.4	Generator set performance measurements are reported to the work supervisor through the established maintenance reporting procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and conducting periodic maintenance of remote area power supply (RAPS) generator sets.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK104A **RAPS system generator sets maintenance techniques**

Evidence shall show an understanding of maintaining remote area power supply generator sets to an extent indicated by the following aspects:

T1 Basic generator set maintenance encompassing:

- Checking of radiator and oil level;
- Periodic oil change
- Periodic air, oil and fuel filter change.
- Maintaining log books for maintenance regime

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct periodic maintenance of remote area power supply (RAPS) generator sets as described in 8) and including:

A Measuring and recording generator no-load and load voltages

B Measuring and recording generator output for three load conditions

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C	Checking drive engine coolant and oil level
D	Visually inspecting drive engine for coolant and oil leaks
E	Checking condition of drive engine oil, oil filter and air filter
F	Identifying need to change drive engine oil, oil filter and air filter
G	Changing drive engine oil, oil filter and air filter
H	Topping up low coolant and oil levels
I	Identifying the cause of any coolant and oil leaks
J	Reporting all maintenance activities
K	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting periodic maintenance of remote

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area power supply (RAPS) generator sets.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks
UEENEEK105A	Conduct periodic maintenance of remote area power supply photo voltaic arrays
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to least two different RAPS systems in which the generator set is charged from a generator set and a photo voltaic array and at least one similar RAPS system where the generator set is charged form a wind generator.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK105A Conduct periodic maintenance of remote area power supply photo voltaic arrays

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers maintenance of remote area power supply (RAPS) photo voltaic arrays where the exposed voltage is not greater than 50 V a.c. or 120 V d.c. It encompasses working safely and to maintenance standards and following maintenance routines, identifying known types of photo voltaic array faults using routine procedures and completing the necessary maintenance reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEK102A	Work safely with remote area power supply systems
UEENEEE131A	Solve problems in ELV circuits for non electrical workers

OR

UEENEEE104A	Solve problems in d.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct periodic maintenance on photo voltaic arrays	1.1	OHS procedures for a RAPS plant are identified, obtained and understood through established routines and procedures.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature and location of RAPS system is identified from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

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ELEMENT		PERFORMANCE CRITERIA	
			fellow workers and the local community.
		1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures.
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Maintain RAPS systems photo voltaic arrays	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Prescribed maintenance procedures are used to test and check RAPS system photo voltaic arrays.
		2.5	Photo voltaic array maintenance, including performance measurements and repairs are carried out safely and to prescribed routines and procedures.
		2.6	Known types of photo voltaic array functional faults are identified using routine fault finding procedures.
		2.7	Procedures are followed for referring non-routine events to immediate supervisor for directions.
		2.8	Maintenance and repair work is carried out efficiently without waste of materials and energy and without damage to apparatus, circuits, the surrounding environment or services
		2.9	Routine quality checks are carried out in accordance with work instructions.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete maintenance work of photo voltaic arrays and report	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with routine procedures.
	3.3	Procedures for referring local maintenance issues to the community are followed.
	3.4	Photo voltaic array performance measurements are reported to the work supervisor through the established maintenance reporting procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and conducting periodic maintenance of remote area power supply (RAPS) photo voltaic arrays sets.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK105A **RAPS systems photovoltaic array maintenance techniques**

Evidence shall show an understanding of maintaining remote area power supply (RAPS) photovoltaic arrays to an extent indicated by the following aspects:

T1 RAPS systems photovoltaic array maintenance techniques encompassing:

- Cleaning of photo voltaic modules
- Checking for damage or de-lamination
- Checking of module connections, connecting cable and integrity of the array structure
- Maintaining log books and maintenance regime

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices & workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct periodic maintenance of remote area power supply (RAPS) photo voltaic arrays as described in 8) and including:

A Measuring and recording array no-load and load voltages together with ambient temperature

B Measuring and recording array output for three

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	load conditions
C	Visually inspecting array modules and support structure for physical damage
D	Visually inspecting array connections and cables
E	Identifying array defects and faults
F	Reporting all maintenance activities
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting periodic maintenance of remote area power supply (RAPS) photo voltaic arrays.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to least two different RAPS systems in which the photo voltaic array is charged from a photo voltaic array and a photo voltaic array and at least one similar RAPS system where the photo voltaic array is charged form a wind generator.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK106A Conduct periodic maintenance of remote area power supply wind generators

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers maintenance of remote area power supply (RAPS) wind generators where the exposed voltage is not greater than 50 V a.c. or 120 V d.c. It encompasses working safely and to maintenance standards and following maintenance routines, identifying known types of wind generator faults using routine procedures and completing the necessary maintenance reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEK102A	Work safely with remote area power supply systems
UEENEEE131A	Solve problems in ELV circuits for non electrical workers

OR

UEENEEE104A	Solve problems in d.c. circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct periodic maintenance on wind generators	1.1	OHS procedures for a RAPS plant are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature and location of RAPS system is identified from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

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ELEMENT	PERFORMANCE CRITERIA	
		fellow workers and the local community.
	1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Maintain RAPS systems wind generators	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Prescribed maintenance procedures are used to test and check RAPS system wind generators
	2.5	Wind generator maintenance, including performance measurements and repairs, are carried out safely and to prescribed routines and procedures.
	2.6	Known types of wind generator functional faults are identified using routine fault finding procedures.
	2.7	Procedures are followed for referring non-routine events to immediate supervisor for directions.
	2.8	Maintenance and repair work is carried out efficiently without waste of materials and energy and without damage to apparatus, circuits, the surrounding environment or services
	2.9	Routine quality checks are carried out in accordance with work instructions.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete maintenance work of wind generators and report	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with routine procedures.
	3.3	Procedures for referring local maintenance issues to the community are followed.
	3.4	Wind generator performance measurements are reported to the work supervisor through the established maintenance reporting procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and conducting periodic maintenance of remote area power supply (RAPS) wind generators.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK106A RAPS systems wind generator maintenance techniques

Evidence shall show an understanding of maintaining small wind generator systems to an extent indicated by the following aspects:

T1 Wind generator minor maintenance encompassing:

- Checking the integrity of support structure
- Tension of stay wires
- Visual inspection of wind generator operation
- Maintaining log books and maintenance regime

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct periodic maintenance of remote area power supply (RAPS) wind generators as described in 8) and including:

A Measuring and recording generator no-load and load voltages;

B Measuring and recording generator output for three load conditions;

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C	Visually inspecting generator and support structure for physical damage;
D	Visually inspecting generator connections and cables;
E	Identifying generator defects and faults;
F	Reporting all maintenance activities
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting periodic maintenance of remote area power supply (RAPS) wind generators.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets
UEENEEK105A	Conduct periodic maintenance of remote area power supply photo voltaic arrays

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to at least two different RAPS systems in which the battery bank is charged from a generator set and a wind generator.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK107A Conduct checks in the demand side use of remote area power supplies (RAPS)

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers checking the community use of a remote area power supply. This encompasses working safely, taking system readings, replacing the data-logging chip, identifying known types of systems faults caused by inappropriate use of electrical apparatus supplied from a remote area power supply system and completing the necessary check report.

Application of the Unit

Application of the Unit

2)

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEK102A	Work safely with remote area power supply systems
UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets
UEENEEK105A	Conduct periodic maintenance of remote area power supply photo voltaic arrays
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability

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Employability Skills	**5)** Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to check RAPS system use	1.1	OHS procedures for a RAPS system are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature and location of RAPS system is identified from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with fellow workers and the local community.
	1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for

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ELEMENT	PERFORMANCE CRITERIA	
		correct operation and safety
2 Check use of RAPS system	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Prescribed check procedures are used to test and check RAPS systems
	2.5	Retrieval of performance data is carried out safely and to prescribed routines and procedures.
	2.6	Known types of functional faults are identified using routine fault finding procedures.
	2.7	Procedures are followed for referring non-routine events to immediate supervisor for directions.
	2.8	Checking is carried out efficiently without waste of materials and energy and without damage to apparatus, circuits, the surrounding environment or services
	2.9	Routine quality checks are carried out in accordance with work instructions.
3 Complete check of RAPS system and report	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with routine procedures.
	3.3	Procedures for referring local check issues to the community are followed.
	3.4	Check results are reported to the work supervisor through the established check reporting procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and conducting checks in the demand side use of remote area power supplies.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK107A RAPS system use auditing techniques

Evidence shall show an understanding of effective RAPS systems use to an extent indicated by the following aspects:

T1 General safety

T2 Demand side use of power systems encompassing:

- Demand exceeds supply
- Size or capacity of the system
- Energy needs of the end users
- Energy use awareness of the end users
- Data logging chips

T3 Demand versus supply encompassing:

- selecting appliances
- using appliances
- using lights, hot water, freezers
- energy efficient items;
- CFL globes
- water saver shower heads
- weather stripping
- appropriate use of RAPS system components - overloading system components, using generator supply for heavy loads and the like.

T4 Reporting

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct checks in the demand side use of remote area power supplies as described in 8) and including:

A Retrieving of performance data

B Identifying demand use issues

C Reporting all check activities

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting checks in the demand side use of remote area power supplies.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to least two different RAPS systems in which the battery bank is charged from a generator set and a wind generator.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK108A Plan periodic maintenance schedules of remote area power supplies (RAPS)

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers plant maintenance planning and scheduling. It encompasses developing and self managing simple maintenance programs, replacing some specified components and reporting of maintenance work.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training and may be used to augment other electrotechnology qualifications at AQF 3 level or higher. Additionally, this unit may apply to indigenous persons entering work in remote area power supply (RAPS) servicing. The unit may also apply to renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may, in some States/Territories, require a license to practice in the workplace subject to regulations for undertaking plant maintenance planning and scheduling related to RAPS work. Practice in workplace and during training may also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEK102A	Work safely with remote area power supply systems
UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish maintenance requirements	1.1	OHS policies and procedures, skills required and frequency and level of maintenance work are determined in accordance with maintenance routines
	1.2	Records are established to manage maintenance work and up-to-date accordance with routine

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ELEMENT		PERFORMANCE CRITERIA	
			procedures
		1.3	Level of replacement or repair to be done under maintenance work is established in accordance with manufacturer and community requirements
		1.4	Needed maintenance program, including basic periodic instruction in demand side use, is established in accordance with local community requirements
2	Develop and implement maintenance schedule	2.1	Maintenance schedules are developed from recommendations of equipment manufacturers and in accordance with RAPS system safety and performance requirements
		2.2	Procedures are developed and implemented to ensure the maintenance program is followed in accordance with the planned schedule and requirements
		2.3	Procedures are developed and implemented to ensure records are maintained in accordance with planned schedule and requirements
3	Evaluate maintenance program	3.1	Periodic and sample inspection reports are used to ascertain maintenance quality and the need for revision of maintenance schedule and frequency
		3.2	Maintenance schedule is periodically reviewed and revised to maintain the integrity of the RAPS system

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of plant maintenance planning and scheduling, encompassing the development and self management of simple maintenance programs, replacing some specified components and reporting of maintenance work.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK108A RAPS system maintenance schedule

Evidence shall show an understanding of maintaining scheduling for RAPS systems to an extent indicated by the following aspects:

Maintenance scheduling encompassing:

- Limitation of the role of the RAPS service worker
- Periodic maintenance planning procedures encompassing:
  - Development of vehicle booking procedures, check lists for replacement equipment, items to be checked, items to be replaced and procedures for recording and reporting.
  - Scheduling of maintenance at a number of homeland communities.
  - Check list for preparation of service vehicle and tools and equipment needed to carry out the maintenance
  - Processes for sourcing and funding replacement component

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop a plan for periodic maintenance of RAPS systems located in different communities as listed in 8). It must incorporate the following components:

A Safety requirements

B Items to be check and tested

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C	Items to be replaced or repaired
D	Frequency of the periodic maintenance
E	Materials and equipment required
F	Time needed to conduct maintenance on each RAPS system
G	Travel distance and times to each community
H	Protocols for working in different communities,
I	Methods for recording and evaluating maintenance,
J	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Access to a supervisor for obtaining work instructions and advice.
- Maintenance and repair materials
- Maintenance requirements for RAPS system incorporating Battery bank; Engine driven generator sets; Fuel storage; Inverter and regulator; Photo voltaic array, and Wind generators.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and

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replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing a plan for periodic maintenance of RAPS systems located in different communities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in plant maintenance planning and scheduling including developing and self managing simple maintenance programs, replacing some specified components and reporting of maintenance work according to established procedures and requirements.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK109A Attend to breakdowns in remote area power supplies (RAPS)

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers attending to a breakdown of remote area power supplies. It encompasses working safely, ascertaining the nature of a breakdown, the extent of repairs required and the personnel needed to repair the breakdown, and reporting so arrangements can be made for the repair work to be carried out. It also encompasses undertaking specified minor repairs.

Application of the Unit

Application of the Unit **2)**

This unit must apply to indigenous persons entering work in remote area power supply (RAPS) servicing. The unit may also apply to renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However they are subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE103A	Solve problems in ELV single path circuits
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to undertake maintenance work	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	The nature of maintenance work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others
	1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Carry out maintenance work	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established

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ELEMENT	PERFORMANCE CRITERIA	
		safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Procedures are followed for referring non-routine events to immediate supervisor for directions
	2.5	Work is done efficiently without waste of materials and energy
	2.6	Work is done without damage to apparatus, circuits, the surrounding environment or services
	2.7	Routine quality checks are carried out in accordance with work instructions.
3 Complete work and report	3.1	OHS risk control work completion measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with established procedures
	3.3	Work supervisor is notified of the completion of maintenance in accordance with established procedures and documented

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and attending to breakdowns in remote area power supplies.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK109A **Remote area essential services facilities**

Evidence shall show an understanding of remote area essential

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REQUIRED SKILLS AND KNOWLEDGE

service facilities breakdowns to an extent indicated by the following aspects:

Remote area essential services facilities repairs encompassing:

- windows repairs
- fences repairs
- gate repairs
- locks an catches repairs

Power generation components repairs encompassing:

- Diesel engine minor repairs
- Generator minor repairs
- Batteries minor repairs
- photovoltaic arrays minor repairs
- wind generators minor repairs
- auxiliary equipment minor repairs

Electrical lighting services minor repair encompassing:

- Incandescent light globes
- Fluorescent tubes
- Fluorescent light starters
- Diffusion devices
- Safety awareness

Essential services facilities safety and security and emergency checks encompassing:

- Broken windows
- Faulty lighting
- Damaged gates
- Logging the inspections
- Notification of the situation
- Safety awareness

Telephone encompassing:

- Answer calls promptly and clearly.
- Using designated business protocol procedures.
- Making and receiving telephone calls in a workplace related context.
- Obtain accurate telephone numbers from an appropriate source.
- Establish contact using designated business protocol

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REQUIRED SKILLS AND KNOWLEDGE

- procedures.
- Convey purpose all call clearly and concisely.

Electrical encompassing:

- Identification and basic function of electrical components used
- for generating and distributing.
- Electricity safety procedures when working with electricity.
- Identification of faulty electrical components.
- Reporting of faulty electrical components.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Attend to breakdowns in remote area power supplies as described in 8) and including:

A	Working safely
B	Ascertaining the nature of a breakdown
C	Ascertaining the extent of repairs required and the personnel needed to repair the breakdown
D	Reporting so arrangements can be made for the repair work to be carried out
E	Undertaking specified minor repairs
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved

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industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to attending to breakdowns in remote area power supplies.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK103A	Conduct periodic maintenance of remote area power supply battery banks
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets
UEENEEK106A	Conduct periodic maintenance of remote area power supply wind generators

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit may be demonstrated in relation to attending to breakdowns in remote area power supplies.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK110A Co-ordinate maintenance of renewable energy (RE) apparatus and systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers coordinating the maintenance of renewable energy apparatus and systems. It encompasses working safely, following maintenance schedules, ascertaining the extent of any repairs required, and the personnel needed to repair the breakdown, providing technical support to maintenance personnel and reporting.

Application of the Unit

Application of the Unit **2)**

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE103A	Solve problems in ELV single path circuits
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to coordinate maintenance	1.1	OHS procedures for a given work area are obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel
	1.4	The extent of work is determined from job specifications, drawings and regulatory requirements
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	Competencies needed to undertake work are determined from job specifications and/or consultation with appropriate personnel
	1.7	Personnel and materials needed to undertake maintenance are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to undertake maintenance are obtained in accordance with established procedures and checked for correct operation and safety
	1.9	Preparatory work is checked to ensure no damage has occurred and complies with

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ELEMENT		PERFORMANCE CRITERIA	
			requirements
2	Carry out maintenance	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Maintenance is carried out in compliance with technical standards and job specifications and requirements
		2.5	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
		2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.7	Ongoing checks of the quality of maintenance are undertaken in accordance with job specification, technical standards and/or regulatory requirements
		2.8	Work efficiently without waste of materials and energy or damage to apparatus, circuits, the surrounding environment or other services
3	Complete work	3.1	OHS risk control work completion measures and procedures are followed
		3.2	Work site is made safe in accordance with established safety procedures
		3.3	Verify maintenance conforms to requirements
		3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and co-ordinating maintenance of renewable energy apparatus and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK110 A **Scheduled maintenance process**

Evidence shall show an understanding of scheduled maintenance processes to an extent indicated by the following aspects:

Maintenance principles encompassing:

- maintenance function
- role of maintenance department
- occupational health and safety requirements

Maintenance systems encompassing:

- maintenance terminology
- preventative maintenance
- predictive maintenance
- corrective maintenance

Data acquisition encompassing:

- plant history cards/files
- inspection techniques
- predictive maintenance
- remote visual inspection
- non-destructive testing
- thermography
- vibration analysis
- oil analysis

Maintenance plan encompassing:

- characteristics of plant operation
- assessment of failure characteristics

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REQUIRED SKILLS AND KNOWLEDGE

- link failure characteristics to maintenance systems
- identify production windows
- resources
- labour
- materials
- establish plan
- implementation procedures

Review of maintenance plan encompassing:

- analysis of records
- manual recording methods

Computerised recording methods.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

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Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement

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- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Co-ordinate maintenance of renewable energy apparatus and systems as described in 8) and including:

A	Interpreting maintenance schedule requirements correctly
B	Accessing appropriate plant, materials and personnel
C	Following maintenance schedule
D	Evaluating apparatus for compliance with specified requirements
E	Arranging for corrective action of non compliant apparatus
F	Documenting maintenance work.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this

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unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to co-ordinating maintenance of renewable energy apparatus and systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit may be demonstrated in relation to co-ordinating maintenance of renewable energy apparatus and systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Renewable and Sustainable Energy

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UEENEEK111A Assemble and connect remote area power supplies

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation of remote area power supply (RAPS) systems where the exposed voltage is not greater than 50 V a.c. or 120 V d.c. It encompasses working safely and to installation standards, matching equipment with that specified for a given location, placing and securing equipment accurately, making required circuit connections and completing the necessary installation documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

And

UEENEEE131A	Solve problems in ELV circuits for non electrical workers

OR

UEENEEE1	Solve problems in d.c. circuits

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Prerequisite Unit(s) **4)**

04A

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install remote area power supplies	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Health and safety risks are identified, and established risk control measures and procedures are followed in preparation for the work
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented
	1.4	Installation of apparatus is prepared in consultation with others effected by the work and sequenced appropriately
	1.5	The nature and location of the work is determined from documentation or appropriate persons to establish the scope of work to be undertaken
	1.6	Locations of apparatus and associated equipment is planned within the constraints of the building structure, significants and regulations
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others
	1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements
	1.9	Tools, equipment and testing devices needed for the installation work are obtained in accordance with established procedures and checked for correct operation and safety
	1.10	Preparatory work is checked to ensure no damage has occurred and that it complies with requirements
2 Install remote area power supplies	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and

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ELEMENT		PERFORMANCE CRITERIA	
			when necessary conducted within established safety procedures
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Apparatus and associated equipment are installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance
		2.5	Wiring is terminated at apparatus and associated equipment in accordance with manufacturer specifications and functional and regulatory requirements
		2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented
		2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.8	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures
		2.9	Apparatus installation is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles
3	Complete maintenance work on battery banks and report	3.1	OHS work completion risk control measures and procedures are followed
		3.2	Work site is cleaned and made safe in accordance with established procedures
		3.3	Final checks are made so that the installed apparatus conforms to requirements
		3.4	‘As-installed’ apparatus and associated equipment is documented and appropriate

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ELEMENT	PERFORMANCE CRITERIA
	person(s) notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and assembling and connecting remote area power supplies (RAPS).

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK111A Remote area power supplies ELV installations requirements

Evidence shall show an understanding of requirements for Remote area power supplies ELV installations to an extent indicated by the following aspects:

Requirements for installation of wiring and equipment

Compliant methods for providing protection

Requirements for installation planning and selection of equipment

Testing and verification requirements

Documentation encompassing:

- results of tests conducted that comply with requirements and ensure the remote area power supplies ELV installation is safe, including any formal documents of the results of testing required by authorities.
- documents of periodic inspection and testing of remote area power supplies ELV wiring and equipment including any tagging, in accordance with requirements.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble and connect remote area power supplies (RAPS) as described in 8) and including:

A Reading and interpreting drawings related to and apparatus locations and circuit connections.

B Placing and securing apparatus accurately

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C	Maintaining fire integrity
D	Connecting apparatus and associated equipment to comply with requirements
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling and connecting remote area power supplies (RAPS).

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets
UEENEEK105A	Conduct periodic maintenance of remote area power supply photo voltaic arrays
UEENEEK107A	Conduct checks in the demand side use of remote area power supplies (RAPS)

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to least two different RAPS systems in which the battery bank is charged from a generator set and a photo voltaic array and at least one similar RAPS system where the battery bank is charged form a wind generator.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK112A Provide basic sustainable energy solutions for energy reduction in residential premises

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers monitoring energy use and providing basic sustainable energy options to reduce the energy consumption in residential premises. It encompasses working safely and providing basic sustainable energy solutions for energy reduction in domestic premises.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in electrotechnology and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work

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License to practice **3)**

platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to monitor energy usage and provide basic solutions for energy reduction	1.1	Monitoring activities are planned and prepared for to ensure OHS policies and procedures are followed with the work appropriately sequenced in accordance with requirements
	1.2	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved
	1.3	Materials are obtained and checked in accordance with established procedures and to comply with requirements
	1.4	Location in which monitoring activities are to be undertaken is determined from job requirements
	1.5	Materials necessary to complete the work are obtained in accordance with established procedures and checked against job requirements
	1.6	Materials needed to carry out the monitoring are obtained in accordance with established procedures
2 Undertake monitoring of energy usage and provide basic solutions for energy reduction	2.1	OHS policies and procedures for undertaking monitoring activities are followed
	2.2	Monitoring activities are undertaken in accordance with requirements, without damage or distortion to the surrounding environment or services
	2.3	Unplanned events or conditions are responded to in accordance with established procedures

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ELEMENT		PERFORMANCE CRITERIA	
		2.4	Approval is obtained in accordance with established procedures from appropriate personnel before any contingencies are implemented
		2.5	Ongoing checks of the quality of the work are carried out in accordance with established procedures
3	Complete monitoring activities and provide and provide reports where necessary	3.1	Documentation/reports are completed to ensure administrative requirements are met
		3.2	Work completion is notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and providing basic sustainable energy solutions for energy reduction in domestic premises.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK112A **Concepts of renewable energy**

Evidence shall show an understanding of concepts of renewable energy to an extent indicated by the following aspects:

T1 Non-technical issues encompassing:

- current economic, social, environmental and political issues, impact on a renewable energy technology

T2 Energy services/demand encompassing:

- terminology
- energy, power, temperature, symbols, units

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REQUIRED SKILLS AND KNOWLEDGE

- energy conversion and efficiency
- domestic dwelling: energy services and energy demand of individual appliance,
- energy efficient appliances
- primary energy and end use energy
- embodied energy

T3 Solar radiation resource encompassing:

- terminology
- units, symbols, conversions
- sun path diagrams
- solar contour maps
- solar window

T4 Solar thermal systems encompassing:

- terminology
- components
- applications
- types of hot water systems

T5 Photovoltaic arrays encompassing:

- terminology
- current, voltage and power
- modules: types, efficiency, applications
- IV curve
- irradiance and temperature effects
- array configurations

T6 Wind energy resource and technology encompassing:

- terminology, units, symbols
- wind speed, direction, turbulence, wind power,
- vertical wind speed profile (wind shear)
- local terrain roughness
- isovent maps
- measuring instruments
- Wind Energy Conversion Systems (WECS)
- terminology
- characteristics
- applications

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REQUIRED SKILLS AND KNOWLEDGE

T7 Micro-hydro resource and technology encompassing:

- terminology, units, symbols
- flow rate, head, assessment
- turbine types and applications

T8 Stand-alone power system configuration encompassing:

- basic configuration series systems
- components: functions, efficiencies; regulators, inverters, battery chargers, generators

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide basic sustainable energy solutions for energy reduction in domestic premises as described in 8) and including:

A	Providing basic sustainable energy solutions for energy reduction in domestic premises
B	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and

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replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing basic sustainable energy solutions for energy reduction in domestic premises.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to the provision of basic sustainable energy solutions for energy reduction in domestic premises in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK114A Promote sustainable energy practices in the community

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the promotion of recognised, safe, sustainable energy practices to others in the community.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in electrotechnology and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work

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License to practice **3)**

environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Plan and prepare to promote sustainable energy practice	1.1	Activities are planned and prepared to ensure OHS policies and procedures are followed with the work appropriately sequenced in accordance with requirements
		1.2	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved
		1.3	Materials are obtained and checked in accordance with established procedures and to comply with requirements
		1.4	Location in which activities are to be undertaken is determined from requirements
		1.5	Materials necessary to complete the work are obtained in accordance with established procedures and checked against job requirements
2	Promote sustainable energy practice	2.1	OHS policies and procedures for undertaking administrative functions are followed
		2.2	Activities are undertaken in accordance with requirements without damage or distortion to the surrounding environment or services
		2.3	Unplanned events or conditions are responded to in accordance with established procedures
		2.4	Approval is obtained in accordance with established procedures from appropriate personnel before any contingencies are implemented

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Ongoing checks of the quality of the work are undertaken in accordance with established procedures
3 Complete the promotion of sustainable energy	3.1	Documentation/reports are completed to ensure detailed promotional activities requirements are met
	3.2	Completion is notified in accordance with established procedure

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and promoting sustainable energy practices in the community.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK114A **Greenhouse reduction strategies**

Evidence shall show an understanding of greenhouse gas reduction strategies to an extent indicated by the following aspects:

T1 Greenhouse gas emissions profile encompassing:

- goals and principles of the National Greenhouse Strategy
- what a greenhouse gas inventory is, why it is required, and the sectors to which it applies
- uses to which the National Greenhouse Gas Inventory can be applied.

T2 Understanding and communicating climate change and its impacts encompassing:

- the possible impact of climate change in Australia.
- techniques for improving the understanding of climate change
- techniques for communicating to and educating the general public on greenhouse gas induced climate change.

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REQUIRED SKILLS AND KNOWLEDGE

T3 Partnerships for greenhouse action encompassing:

- actions achievable by each level of government to implement the NGS.
- methods by which the community activity can be engaged in the reduction of greenhouse gas emissions.
- initiatives that can be undertaken by the private sector to reduce greenhouse gas emissions.
- advantages of international partnerships.
- emissions trading system.

T4 Efficient and sustainable energy use and supply encompassing:

- techniques for reducing the greenhouse intensity of energy supply.
- types of renewable energy sources suitable for use in Australia.
- methods and technique for improving end-use efficiency.

T5 Efficient transport and sustainable urban planning encompassing:

- how integrating land use and transport planning can assist the greenhouse problem.
- how each of the following can be used to mitigate greenhouse gas; travel demand and traffic management strategies; encouraging greater use of public transport, walking and cycling; freight and logistics systems; improving vehicle fuel efficiency and fuel technologies;

T6 Greenhouse sinks and sustainable land management encompassing:

- how enhancing greenhouse sinks and encouraging sustainable forestry and vegetation management can complement the AGS.
- how greenhouse gas emissions are obtained from agricultural production and describe techniques to mitigate the emissions.

T7 Models of greenhouse best practice in industrial processes and waste management encompassing:

- types and methods of reducing greenhouse gas emissions from industry.
- methods of reducing methane emissions from waste treatment and disposal.

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REQUIRED SKILLS AND KNOWLEDGE

T8 Adaptation to climate change encompassing:

- salient points in each of the key sectors that require analysis and the strategies required in the need for adaptation to climate change

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to

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minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

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- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Promote sustainable energy practices in the community as described in 8) and including:

A Applying sustainable energy practice in the community

B Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to promoting sustainable energy practices in the community.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to promoting sustainable energy practice in the community in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable/sustainable energy
- Security technology

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK116A Maintain and repair remote area power generation facilities

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Show full pre-req chain in the unit	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers basic maintenance of power generation facilities in remote areas It encompasses working safely, following maintenance schedules to inspect, repair, replace and adjustment equipment, maintaining a clean and efficient generation facility and completing the necessary reporting.

Application of the Unit

Application of the Unit

2)

This unit is intended primarily for indigenous persons seeking qualifications in remote area utilities facilities servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However,

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License to practice **3)**

practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrotechnology

Remote Area

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **4)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEK101A	Maintain safety and tidiness of remote area power supply systems
UEENEEK102A	Work safely with remote area power supply systems
UEENEEK104A	Conduct periodic maintenance of remote area power supply generator sets

Electrotechnology Pathway Group

UEENEEE104A	Solve problems in d.c. Circuits

Remote Area Pathway Group

UEENEEE131A	Solve problems in ELV circuits for non electrical workers

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills **5)**

qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to maintain and repair remote area power generation facilities	1.1	OHS procedures for a remote area power station facility are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	The nature and location of remote area power station facility is obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with fellow workers and the local community
	1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for

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ELEMENT	PERFORMANCE CRITERIA	
		correct operation and safety.
2 Maintain and repair remote area power generation facilities	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.2	Inspection, repairs, replacements and/or adjustments are carried out on items listed in the maintenance schedule and in accordance with established procedures.
	2.3	Fuel, coolant, oil and other fluid spills are cleaned and area made safe in accordance with established procedures.
	2.4	Batteries are serviced and/or replaced as specified in the maintenance schedule and in accordance with established procedures.
	2.5	Consumables are removed and disposed of following environmentally safe procedures.
	2.6	Procedures are followed for referring non-routine events to immediate supervisor for directions
	2.7	Routine quality checks are carried out in accordance with work instructions
3 Report maintenance and repair of remote area power generation facilities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Procedures are followed for referring maintenance issues beyond the scope of prescribed work to persons of higher authority.
	3.3	Work carried out is reported to the work supervisor through the established maintenance reporting procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and maintaining and repairing facilities associated with remote area essential service operations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK116A Remote area essential services power plant

Evidence shall show an understanding of remote area essential services power plant to an extend indicated by the following aspects:

Minor service and maintenance procedures of diesel powered generation equipment in accordance with a prepared schedule encompassing:

- Types and grades of inspections, repairs, replacement and/or adjustments under a maintenance schedule:
  - Replacement items/materials include engine oil, oil filters, fuel filters, engine coolant system filters, air cleaners and fan belts;
  - Inspection and repair items include leakages from fuel system, coolant system and lubricating oil system.
- Cleaning of fluid spills.
- Environmentally safe procedures for removal and disposal of consumables.

Servicing batteries and battery packs in a community power station in accordance with the prepared maintenance schedule encompassing:

- Hazards associated with batteries.
- Types of batteries and their application in a community power station (Starting battery set, switchboard (nicad) batteries)
- Battery maintenance techniques

Schedule regular servicing and maintenance encompassing:

- Engine oil and filter changes;
- Fuel filters;
- Coolant filters

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REQUIRED SKILLS AND KNOWLEDGE

- Water trap devices
- Drive belt (condition/adjustment);
- Valve adjustments (if applicable);
- Major and minor mechanical servicing by outside agents;
- Air cleaner (both dry paper and oil bath types)

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining

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competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement.
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain and repair remote area power generation facilities as described in 8) and including:

A	Understanding the location and nature of the work required
B	Correctly inspecting, repairing, replacing and adjusting items listed in the maintenance schedule
C	Cleaning fluid spills appropriately.
D	Removing and disposing of consumable following environmentally safe procedures.
E	Documenting work activities accurately
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

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Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining and repairing facilities associated with remote area essential service operations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to least two different remote area power generation facilities.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Renewable and Sustainable Energy

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UEENEEK117A Maintain and repair facilities associated with remote area essential service operations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers basic maintenance of remote area infrastructure facilities. It encompasses working safely, to maintenance standards and following maintenance routines, identifying deterioration and damage to facilities using routine procedures, and completing the necessary maintenance reporting.

Application of the Unit

Application of the Unit **2)**

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE103A	Solve problems in ELV single path circuits

And

UEENEEE131A	Solve problems in ELV circuits for non electrical workers

OR

UEENEEE104A	Solve problems in d.c. circuits

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to maintain and repair facilities	1.1	OHS procedures for a RAPS plant are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	The nature and location of service facilities is obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with fellow workers and the local community
	1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Maintain and repair facilities	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.2	Prescribed procedures are used to check and identify deterioration and damage to facilities
	2.4	Faulty and damaged facilities are repaired using routine procedures
	2.5	Maintenance and repairs are carried out safely and within the prescribed limits, routines and procedures
	2.6	Procedures are followed for referring non-routine events to immediate supervisor for directions
	2.7	Maintenance and repair work is carried out efficiently without waste of materials and energy and without damage to apparatus, circuits, the surrounding environment or services

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ELEMENT	PERFORMANCE CRITERIA	
	2.8	Routine quality checks are carried out in accordance with work instructions
3 Complete maintenance and repair work report	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with routine procedures
	3.3	Procedures are followed for referring maintenance issues beyond the scope of prescribed work to persons of higher authority
	3.4	Work carried out is reported to the work supervisor through the established maintenance reporting procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and maintaining and repairing facilities associated with remote area essential service operations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK117A Remote area essential services facilities

Evidence shall show an understanding of remote area essential services facilities to an extent indicated by the following aspects:

T1 Window repair and maintenance encompassing:

- Emergency repairs
- Louvre type
- Fixed pane type
- Shutters
- Safety awareness

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REQUIRED SKILLS AND KNOWLEDGE

T2 Repair and maintenance to fences and gates encompassing:

- Emergency repairs
- Locks and catches
- Security fencing
- Fence maintenance
- Gates
- Safety awareness

T3 Maintenance painting encompassing:

- Preparation of surfaces
- Block work
- Concrete
- Timber
- Steel
- Paint selection
- Brush and roller selection
- Paint application
- Clean up process
- Paint and accessories storage
- Safety awareness

T4 Essential services facilities lighting encompassing:

- Incandescent lamps
- Compact fluorescent lamps
- Fluorescent tubes
- Fluorescent light starters
- Diffusion devices
- Safety awareness
- Disposal of faulty lamps

T5 Essential services facilities safety and security and emergency checks encompassing:

- Broken windows
- Faulty lighting
- Damaged gates
- Logging the inspections
- Notification of the situation
- Safety awareness

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REQUIRED SKILLS AND KNOWLEDGE

T6 Telephone encompassing:

- Answer calls promptly and clearly.
- Using designated business protocol procedure
- Making and receiving telephone calls in a workplace context
- Obtain accurate telephone numbers from an appropriate source.
- Establish contact using designated business protocol procedures.
- Convey purpose all call clearly and concisely.

T7 Mathematical operations encompassing:

- Whole numbers.
- Fractions
- Decimals
- Percentages
- Ratios
- Proportions

T8 Electrical encompassing:

- Identification and basic function of electrical components used
- for generating and distributing.
- Electricity safety procedures when working with electricity.
- Identification of faulty electrical components.
- Reporting of faulty electrical components.

T9 Fire fighting equipment encompassing:

- Fire extinguishers and signage
- Types of fire extinguishers
- Contents and colour
- Correct identification
- Use of fire extinguishers
- Use of water hose and reel
- Safety awareness

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain and repair facilities associated with remote area essential service operations as described in 8) and including:

A	Understanding the location and nature of the work required
B	Identifying deterioration and damage to facilities

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	correctly
C	Carrying out maintenance and repairs effectively
D	Identifying maintenance issues beyond the scope of prescribed work and notifying appropriate persons
E	Documenting work activities accurately
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items
	Note: Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining and repairing facilities

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associated with remote area essential service operations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to maintaining and repairing facilities associated with at least two different remote area essential service operations

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK118A Maintain and monitor remote area essential service (RAPS) operations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers basic maintenance power station compound of remote area infrastructure facilities, monitoring power station performance and developing a basic maintenance schedule. It encompasses working safely, to maintenance standards and following maintenance routines, identifying deterioration and damage to facilities using routine procedures, reading and recording performance information from instruments/meters and completing the necessary reporting.

Application of the Unit

Application of the Unit **2)**

This unit is intended primarily for indigenous persons seeking qualifications in remote area utilities facilities servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general and be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety and contracts of training such as new apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEK102A	Work safely with remote area power supply systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to maintain and power station compound and monitor performance.	1.1	OHS procedures for a remote area power station facility is identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	The nature and location of remote area power station facility is obtained from documentation or from work supervisor to establish the scope of work to be undertaken

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with fellow workers and the local community
		1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures
		1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
		1.8	Established procedures are followed to repair or replace defective and unsafe tools and service equipment.
2	Maintain power station compound and monitor performance	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
		2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.2	Established procedures are followed to clean and tidy power station building, generating equipment and compound to maintain safe and efficient plant area.
		2.3	Inspection and reporting is conducted on suitability, location and legibility of safety signage.
		2.4	Inspection and reporting is conducted on location, suitability and condition of fighting equipment
		2.5	Performance, status and fuel and oil use of generation equipment is monitored and logged from information displayed instruments, meters and measuring devices.
		2.7	Procedures are followed for referring non-routine events to immediate supervisor for directions
		2.8	Routine quality checks are carried out in

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ELEMENT	PERFORMANCE CRITERIA	
		accordance with work instructions
3 Develop basic maintenance schedule and complete work report	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Maintenance schedule is developed from logged information on power station performance, status and condition of compound.
	3.3	Procedures are followed for referring maintenance issues beyond the scope of prescribed work to persons of higher authority.
	3.4	Work carried out is reported to the work supervisor through the established maintenance reporting procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and maintaining and repairing facilities associated with remote area essential service operations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK118A Power station and compound maintenance

Evidence shall show an understanding of RAPS compound maintenance and meter reading to an extent indicated by the following aspects:

Maintaining clean, tidy and safe condition of the power station building and generating equipment encompassing:

- Removal of generating plant oil, coolant and fuel leaks.
- Removal fluid spills from plant room floor areas.
- Cleaning of power house ventilation systems
- Removal of insects and fauna from plant area.
- Environmentally safe disposal of used consumables and

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REQUIRED SKILLS AND KNOWLEDGE

rubbish.

- Repositioning empted rubbish bins.
- Correct storage of plant spares.

Maintaining a clean, tidy and safe working environment of power station compound encompassing:

- Repairing and securing compound perimeter fencing and gates.
- Removal and environmentally safe disposal of flora from the fence line and plant room perimeter.
- Removal and environmentally safe disposal compound rubbish
- Cutting and watering the compound grassed area.
- Safe arrangements for storage of fuel drums and other flammable liquids.
- Maintaining water reticulation equipment.

Inspecting, classifying and repairing the power station tools and equipment encompassing:

- Inspecting and reporting hand tools and service equipment for serviceability.
- Equipment repair procedures.
- Cleaning and storage of tools and equipment.

Inspecting and reporting on the safety signage displayed in the power station and on the perimeter fence encompassing:

- Types and location of safety signs relevant to a community power station and compound.
- Reporting on the conditions and suitability of the signs.

Locating, inspecting and reporting on the fixed and portable fire fighting equipment contained in and around the power station encompassing:

- Types of fire fighting equipment suitable for a power station.
- Typical locations of power station fire fighting equipment.
- Inspecting and reporting suitability and condition of fire fighting equipment.

Instruments/meters showing performance/status of community power stations encompassing:

- Types of information displayed on the instrument panel and switchboards (engine oil pressure, coolant temperatures fuel pressure/flow, amperes, voltage, kilowatt, kilowatt hours,

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REQUIRED SKILLS AND KNOWLEDGE

frequency Hertz, and engine running hours).

- Instrument/meter reading and recording techniques.
- Dip stick measurement measure and recording methods of bulk fuel and engine oil.

Developing maintenance schedules from logged information of community power station performance encompassing:

- Logged information is that listed in T1 above.
- Maintenance schedules includes timely ordering of fuel, coolant and engine oil, engine oil changes, engine oil filter changes, fan belt condition and adjustment, air cleaner element service, minor tune up requirements, valve adjustments and minor and major overhaul work.

Instrument/meter reading and maintenance scheduling records.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and

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regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement.
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain and monitor remote area essential service operations as described in 8) and including:

A	Understanding the location and nature of the work required
B	Following established procedures for repairing or replacing defectives tools and service equipment
C	Cleaning and tidying power station building, generating equipment and compound effectively.
D	Correctly inspecting and reporting suitability, location and legibility of safety signage.
E	Correctly inspecting and reporting location, suitability and condition of fighting equipment.
F	Accurately monitoring and logging performance, status and fuel and oil use of generation equipment.
G	Developing an appropriate basic maintenance schedule from logged information
H	Documenting work activities accurately
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which

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competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining and repairing facilities associated with remote area essential service operations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to least two different remote area essential service operations.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK120A Maintain operation of remote area power generation plant

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers maintenance of remote area power generation plant where the exposed voltage is not greater than 50 V a.c. or 120 V d.c. It encompasses working safely and to maintenance standards and following maintenance routines, identifying known types of power plant faults using routine procedures and completing the necessary maintenance reporting.

Application of the Unit

Application of the Unit **2)**

This unit is intended primarily for indigenous persons seeking qualifications in RAPS system servicing. The unit may also be applied to work entry qualifications in renewable energy service work in general.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltages above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

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License to practice **3)**

Note.

Competency requirements to be granted a license to carry out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK116A	Maintain and repair remote area power generation facilities

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each

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scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Maintain operation of remote area power generation plant	1.1	OHS procedures for a RAPS plant are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor
	1.4	The nature and location of the power plant is obtained from documentation or from work supervisor to establish the scope of work to be

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ELEMENT	PERFORMANCE CRITERIA	
		undertaken
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with fellow workers and the local community
	1.6	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Maintain operation of remote area power generation plant	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Prescribed maintenance procedures are used to test and check remote area power plant
	2.4	Known types of remote area power plant functional faults are identified and repaired using routine procedures
	2.5	Maintenance, including performance measurements and repairs are carried out safely and to prescribed routines and procedures
	2.6	Procedures are followed for referring non-routine events to immediate supervisor for directions
	2.7	Maintenance and repair work is carried out efficiently without waste of materials and energy and without damage to apparatus, circuits, the surrounding environment or services
	2.8	Routine quality checks are carried out in accordance with work instructions

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete maintenance work and report	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with routine procedures
	3.3	Procedures are followed for referring maintenance issues beyond the scope of prescribed work to persons of higher authority
	3.4	Work carried out is reported to the work supervisor through the established maintenance reporting procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and maintaining operation of remote area power generation plant.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK120A **Remote area essential services power generation plant**

Evidence shall show an understanding of remote area essential services power plant maintenance to an extent indicated by the following aspects:

T1 Minor servicing of a power station‘s generating plant encompassing:

- Engine oil and filters
- Fuel filters
- Coolant filters
- Water trap devices
- Air cleaners

T2 Minor maintenance of a power station‘s generating plant encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Fan and accessory drive belts
- Repair of minor leaks: coolant, oil and fuel

T3 Servicing of a power station‘s generating plants battery systems encompassing:

- Starting battery set
- Switchboard (nicad) batteries

T4 Information displayed by the instruments/meters in a power station encompassing:

- Generating equipment (diesel engine)
- Engine lubrication
- System oil pressure
- Engine cooling system coolant
- Temperature (in and out)
- Fuel pressure
- Current (A)
- Voltage
- Power (kW)
- Kilowatt hours
- Frequency, hertz (Hz)
- Engine running hours
- Station services: Fuel tank dip; Lubricating oil tank level;
- Fuel flow meter

T5 Use of the information gathered from instruments/meters encompassing:

- Ordering of: Fuel; Lubricating oil; Coolant
- Schedule regular servicing and maintenance for: Engine oil and filter changes; Fuel filters; Drive belt (condition/adjustment); Valve adjustments (if applicable); Major and minor mechanical servicing by outside agents; Air cleaner (both dry paper and oil bath types)

T6 Power station log sheets and readings encompassing:

- Completed log sheets
- Forwarding information to appropriate person/location at regular intervals (weekly)

T7 General cleanliness of the power stations plant and buildings encompassing:

- Generation plant

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REQUIRED SKILLS AND KNOWLEDGE

- Oil leaks
- Water leaks
- Fuel leaks
- Safety awareness
- Plant buildings
- Internal floor area
- Used consumables
- Spare parts storage
- Spider webs and other pests
- Rubbish containers
- Ventilation
- Power station compound
- Fence and gate (if applicable)
- Weeds
- Grass (if applicable)
- Rubbish containers
- Fuel and oil supply, (drums)
- Water reticulation (if applicable)
- Tools and equipment
- Location/storage
- Cleanliness
- Maintenance
- Drain/drip tins
- Safety signage
- Location
- Condition
- Suitability

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain operation of remote area power generation plant as described in 8) and including:

A Understanding the location and nature of the work required

B Following prescribe procedures to testing and checking plant.

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C	Identifying and repairing known functional faults
D	Carrying out maintenance and repairs effectively.
E	Identifying maintenance issues beyond the scope of prescribed work and notifying appropriate persons.
F	Documenting work activities accurately.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining operation of remote area power generation plant.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to maintaining operation of at least two different remote area power plants.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK121A Manage renewable energy (RE) projects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the management of renewable energy projects involving design, modifications, installation, and/or maintenance of systems and equipment. The unit encompasses covers management of safety, budget, variation, personnel, resources, and critical path timelines all necessary progress and completion documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish the scope of the project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Project deliverables and budget are identified from project planning and other relevant documentation and from discussions with appropriate person(s)
	1.3	Measurable outcomes are identified to evaluate the project on completion from project planning and other relevant documentation
	1.4	Plant, materials and skills needed to meet project outcome are identified from project planning and other relevant documentation
	1.5	Processes and procedures are developed for managing contract variations from discussions with appropriate person(s) and in accordance with contractual agreement
2 Manage project.	2.1	OHS policies, procedures and programs are implemented and monitored
	2.2	Achievement of project outcomes is delegated to appropriately competent persons involved in the project
	2.3	Risk events are identified and project plan strategies implemented to ensure that outcomes are achieved to the required standard of quality specified in the contract and safety required by organisation policy
	2.4	Procurement processes and procedures are monitored to ensure on-time supply of plant and materials and in accordance with organisation policy
	2.5	Project is progress is monitored against schedule, quality requirements and budget
	2.6	Conflict issues at the work site and between stakeholders, clients and regulators are identified and managed in accordance with organisation

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ELEMENT	PERFORMANCE CRITERIA	
		policy
	2.7	Variations are managed in accordance with agreed processes and in accordance with the contract
	2.8	Project records are maintained and progress reports written and forwarded to all appropriate person(s)
3 Complete project.	3.1	Project outcomes are reviewed against original plan, implemented risk strategies, contract variations, safety record and budget
	3.2	Project completion acceptance is sought from appropriate person(s) and handover documented in accordance with organisation policy

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and managing renewable energy projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK121A **Renewable energy project management**

Evidence shall show an understanding of project management to an extent indicated by the following aspects:

T1 - Project management encompassing:

- Defining project parameters: Project scope; Project stakeholders and clients; Project phases and the relationship between phases; Time requirements and limitations; Resource requirements and limitations; Quality requirements and limitations.
- Time management: time management concepts; standard practices for ensuring a project runs to time and the like.

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REQUIRED SKILLS AND KNOWLEDGE

- Financial management: Financial management concepts; Standard practices for managing project finances; Project budgets; Costs, variations and estimations; Invoicing against project phases/deliverables; Acquittals and the like.
- Quality management: Quality management concepts; Standard practices for managing quality within a project.
- Human Resource management: human resource management concepts; standard practices for managing personnel within a project
- Communication management: Communication management concepts; Standard practices for managing communication within a project and the like.
- Risk management and contingencies: risk management concepts; standard practices for managing risk within a project; Internal risks; External risks; Risk minimisation; Risk removal; Contingencies and the like.
- Procurement management: procurement management concepts; standard practices for managing procurement and the like.
- Physical Resource management: Types of physical resource, including; Equipment, Technology, Information, Facilities; Physical resource management concepts; Standard practices for managing physical resources
- Contracts: Understanding project contracts; Standard practices for working to contract specifications; Contract format; Contract content; Legal obligations of contract parties; Accompanying documentation including; Contract Schedules and the like.
- Performance assessment and continuous improvement: standard performance assessment practices; standard continuous improvement practices and the like
- Engineering ethics principles

T2 - Customer/Client relations encompassing:

- Importance of customer/client relations
- interpersonal skills that enhance customer/client
- Dispute resolution
- Customer/client relations strategies

T3 - Renewable energy industry sector customs and practices encompassing:

- Technical aspects of project planning and management encompassing:
- Method of ensuring equipment meets specified performance

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REQUIRED SKILLS AND KNOWLEDGE

requirements

- Performance/cost benefit analysis
- Equipment procurement\
- Typical approaches to planning and management
- Successful planning techniques
- Best practice management methods and styles

T4 - Occupational Health and Safety, enterprise responsibilities encompassing:

- Provisions of relevant health and safety legislation
- Principles and practice of effective occupational health and safety management
- Management arrangements relating to regulatory compliance
- Enterprise hazards and risks, control measures and relevant expertise required
- Characteristics and composition of workforce and their impact on occupational health and safety management
- Relevance of enterprise management systems to occupational health and safety management
- Analysis of working environment and design of appropriate occupational health and safety management systems
- Analysis of relevant data and evaluation of occupational health and safety system effectiveness
- Assess resources to establish and maintain occupational health and safety management systems.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Manage renewable energy projects as described in 8) and including:

A Establishing the scope of the project accurately,

B Ascertaining the input a project

C Developing effective management processes,

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D	Managing resources and variations effectively
E	Resolving conflicts
F	Adopting risk management strategies
G	Maintaining records and submitting progress reports
H	Meeting project outcomes
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

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practices in relation to managing renewable energy projects.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to managing an industry accepted medium sized renewable energy project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK122A Plan renewable energy (RE) projects

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers development and documentation of renewable energy project proposals, milestones and completions. The unit encompasses, establishing budgets, critical path analysis, development of workflow strategies, documenting, presenting and negotiating budgets and timelines.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to plan project.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established techniques for project planning are reviewed are adopted in accordance with organisation policies
	1.3	The extent of the project is established from design brief, specification and/or other relevant documentation and from discussions with appropriate person(s)
2 Develop project plan proposal.	2.1	Estimated plant, material, labour and other costs are sought and obtained from appropriate person(s) in accordance with organisation policies and procedures
	2.2	Project budget is established from estimated plant, material, labour and other costs in accordance with organisation policies and procedures
	2.3	Knowledge of critical path analysis is applied to developing workflow strategies
	2.4	Sources and availability of materials and human resources needed for the project are identified in accordance with organisation policies and procedures.
	2.5	Risk management strategies are sought and obtained for incorporating in the project plan
	2.6	Project plan is reviewed against all inputs and adjusted to rectify any anomalies
	2.7	Project plan proposal is documented in accordance with organisation policies and procedures
3 Obtain approval for project plan.	3.1	Project plan is presented and discussed with person(s) of higher authority
	3.2	Alterations to the project plan resulting from the presentation/discussion are negotiated with person(s) of higher authority within the

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ELEMENT	PERFORMANCE CRITERIA	
		constraints of organisation policy
	3.3	Final project plan is documented and approval obtained from appropriate person(s)

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and planning renewable energy projects.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK122A **Renewable energy project planning**

Evidence shall show an understanding of RE project planning to an extent indicated by the following aspects:

T1 Project planning encompassing:

- Purpose of project planning
- Documents needed to plan a project
- Factors influencing sequence and restraints of project activities
- Critical path analysis encompassing:
  - Graphical representation methods
  - Methods of representing time/rates

T2 Critical path project analysis encompassing:

- Purpose of critical path analysis
- Essential data
- Relational sequence of work activities
- Graphical representation methods
- Methods of representing time/rates
- Monitoring methods

T3 Renewable energy industry sector customs and practices encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Technical aspects of project planning and management encompassing:
- Method of ensuring equipment meets specified performance requirements
- Performance/cost benefit analysis
- Equipment procurement\
- Typical approaches to planning and management
- Successful planning techniques
- Best practice management methods and styles

T4 Occupational Health and Safety, enterprise responsibilities encompassing:

- Provisions of relevant health and safety legislation
- Principles and practice of effective occupational health and safety management
- Management arrangements relating to regulatory compliance
- Enterprise hazards and risks, control measures and relevant expertise required
- Characteristics and composition of workforce and their impact on occupational health and safety management
- Relevance of enterprise management systems to occupational health and safety management
- Analysis of working environment and design of appropriate occupational health and safety management systems Analysis of relevant data and evaluation of occupational health and safety system effectiveness
- Assess resources to establish and maintain occupational health and safety management systems.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Plan renewable energy projects as described in 8) and including:

A Determining the project requirements accurately,

B Establishing a project budget

C Developing effective work flow strategies,

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D	Documenting project plan proposal
E	Negotiating alterations to the proposed project plan successfully
F	Obtaining approval of the final plan
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items Note: Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to planning renewable energy projects.

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Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to managing an industry accepted medium sized renewable energy project.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK123A Carry out basic repairs to renewable energy apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit deals with the replacement of electrical and non-electrical components of renewable energy apparatus. It encompasses safe working practices, following written and oral instructions and procedures, basic testing techniques, disconnecting and reconnecting electrical/electronic components, dismantling and assembling apparatus and reporting repair activities.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE104A	Solve problems in d.c. circuits

AND

UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

OR

UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

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indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair renewable energy apparatus.	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	The nature of the repair is obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

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ELEMENT	PERFORMANCE CRITERIA	
		others
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established routines and procedures
	1.6	Tools, apparatus and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Repair renewable energy apparatus.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Apparatus is dismantled in accordance with manufacturer's guide and supervisor's instructions
	2.5	Component parts are tagged during the dismantling to help ensure correct and efficient reassembly and stored to protect them against loss or damage
	2.6	Repairs are affected efficiently without damage to other components, apparatus or circuits.
	2.7	Apparatus is assembled in an appropriate sequence with all parts placed, secured and connected in accordance with manufacturer guide or industry practice
	2.8	Procedures are followed for referring non-routine events to immediate supervisor for directions
	2.9	Repairs are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using

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ELEMENT	PERFORMANCE CRITERIA	
		sustainable energy practices
3 Complete and report repair work activities.	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Repaired apparatus is prepared for testing by an appropriate person
	3.3	Work area is cleaned and made safe in accordance with established procedures
	3.4	Work supervisor is notified of the completion of the repair work in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and carrying out basic repairs to renewable energy apparatus by replacement of components.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK123 A Introduction to renewable energy technologies

Evidence shall show an understanding of renewable energy principles and technologies to the extent indicated by the following aspects:

T1 Major non-technical issues encompassing:

- impact of economic, social, environmental and political issues on the use of renewable energy technologies.
- how each of the non-technical issues impact on the application of a selected renewable energy technology.

T2 Energy services and demand encompassing:

- definition of the terms: energy, power, energy efficiency, end use energy, primary energy, embodied energy.
- calculation relating to energy, power and time with the

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REQUIRED SKILLS AND KNOWLEDGE

appropriate number and time with the appropriate number of significant figures.

- units and symbols for energy, power, time and temperature using standard SI units and prefixes.
- conversion of energy and power quantities from one unit to another using conversion tables
- the two laws that apply to any energy conversion process.
- efficiency of a simple energy conversion process.
- energy services required by a domestic dwelling.
- power and energy consumption of individual appliances and systems using appropriate meters or other methods.
- calculation of the end use and primary energy required for these energy services.
- selection of the most appropriate energy source for each of these services.
- justification in terms of environmental, economic, social and political constraints.
- selection of appropriate energy efficient appliances and technologies.

T3 The solar resource encompassing:

- definition of the terms: irradiation, latitude, solar constant, direct and diffuse radiation, azimuth and altitude angles, irradiance, solar window, tilt angle, solstice, equinox.
- units and symbol for irradiation and irradiance and the conversion of one unit to another using conversion tables.
- measurement of solar irradiance with a solarimeter.
- solar radiation data tables and contour maps.
- position of the sun for a given date, time and latitude using a sun path diagram.
- times when an obstacle will shade a given collector.
- how radiation varies throughout the year on the surface of a collector which is either fixed, single-axis tracking or double-axis tracking.
- appropriate tilt angles for fixed and seasonally-adjustable collectors at a given latitude and given application
- calculation of the effect of single-axis tracking and double-axis tracking on collected radiation using radiation data tables.

T4 Solar thermal systems encompassing:

- definition of the terms: conduction, convection, radiation, collector heat loss co-efficient, conductivity, specific hear,

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REQUIRED SKILLS AND KNOWLEDGE

solar fraction.

- components for a solar thermal system including collector, storage, reticulation and control.
- solar collector types suitable for low, medium and high temperature applications.
- different types of domestic solar hot water (SWH) systems.
- how the components of thermosiphon and pumped storage systems operate.
- heat loss mechanisms in collectors.
- stratification in storage tanks.
- backup energy systems.
- control and protection strategies.
- solar fraction of a domestic SHW system with the use of table or nomograms.

T5 Energy efficient building design encompassing:

- definition of the terms: thermal comfort, passive system, active system, aspect of the site, orientation of the building, thermal mass.
- the climate factors which affect building design.
- relationship between thermal comfort and climate.
- relationship between the seasonal variation of the sun's path and the heat gain of the building elements (roof, walls, windows, floor).
- effect of the thermal conductivity of building materials on heat flows to and from the building
- use of thermal mass in reducing temperature variations within the building.
- use of ventilation.
- thermal performance of a dwelling using both indoor and outdoor hourly temperature measurements over the period of at least one day.
- effect of insulation, glazing, orientation, shading devices, thermal mass and ventilation on the thermal performance of a building.
- an active solar system which could be used in a dwelling to complement passive design features in extreme climates.
- aspects of an existing dwelling that contribute to or detract from thermal performance.

T6 Photovoltaic arrays encompassing:

- definition of the terms: photovoltaic (PV) cell, module, series,

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REQUIRED SKILLS AND KNOWLEDGE

parallel, array, maximum power point (MPP), nominal operating cell temperature (NOCT), short circuit current (ISC), open Circuit voltage (VOC), I-V curve, current at maximum power point (IMP), voltage at maximum power point (VMP).

- calculations relating to voltage, current and power with the appropriate number of significant figures and using standard SI units and prefixes.
- types of commercially available PV modules, their efficiency and typical applications.
- I-V curve for a typical PV module and label the approximate position of MPP and values of ISC, VOC, IMP and VMP.
- effect of irradiance and temperature on ISC, VOC, IMP and VMP.
- function of blocking and bypass diodes.
- current and voltage of a single module to produce the I-V characteristic curve.
- major specification criteria for a PV module.
- size and configuration of a PV array for a given load and system voltage using tables or nomograms.

T7 Wind energy resources encompassing:

- definition of the terms: kinetic energy, specific wind power, vertical wind speed profile, surface roughness, temperature inversion layer, cut in (vC), rated (vR) and furling (vF) wind speeds, rated power (PR), power co-efficient (cP), output co-efficient (cO), tip speed ratio.
- units and symbols for wind speed, specific wind power and air density.
- large scale wind patterns over the Australian continent, their causes and the effect of local terrain on wind speed, direction and turbulence.
- specific wind power for given wind speeds.
- wind speed at different heights above ground level.
- the mean wind speed based on wind speed frequency distribution data in the form of a histogram.
- suitable minimum tower height for a Wind.
- energy conversion System (WECS) sited downwind from an obstacle.
- isovent maps.
- types of wind-measuring instruments and the minimum requirements for assessing wind energy at a given site.
- measurement of wind speed and direction

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REQUIRED SKILLS AND KNOWLEDGE

- characteristics of horizontal axis and vertical axis, upwind and downwind, lift and drag propelled wind turbines.
- power vs. wind speed curve for a typical WECS showing vC, vR, vF, and PR.
- major specification criteria for a WECS.
- sizing a WECS for a given load, efficiency and annual mean wind speed using tables or a nomogram.

T8 Micro-hydro system basis encompassing:

- definition of the terms: flow rate, gross or static head, potential energy, net or dynamic head, hydraulic efficiency, MHS efficiency, equivalent pipe length, reaction turbine, impulse turbine
- units and symbols for: flow rate, head, gravitational constant
- methods each assessing flow rate and head.
- measurement of stream flow rate and head.
- assessment from contour maps.
- different MHS in terms of their physical and operating characteristics.
- major specification criteria for an MHS for electricity generation.
- suitable type and size of MHS for a given load, efficiency, available flow rate and net head using tables or a nomogram.

T9 Energy storage encompassing:

- methods of energy storage.
- energy density of the energy storage methods above by mass and volume.
- define the following terms in relation to batteries: nominal voltage, cell, primary and secondary cells, battery, charge and discharge rate, amp hour capacity, watt hour capacity, state of charge (SOC), depth of discharge (DOD), specific gravity (SG), watt hour and amp hour efficiency, cycle life.
- major features of common types of batteries suitable for stand-alone power systems.
- state of charge of a lead-acid battery through measurement of specific gravity or battery voltage using safe working practices.

T10 Stand alone power system basis encompassing:

- d.c. sub-system efficiency.
- block diagram of a typical SPS
- function of each SPS system component

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REQUIRED SKILLS AND KNOWLEDGE

- typical efficiencies of each component.
- major characteristics of different types of commercially available regulators, inverters and battery chargers.

T11 Biomass encompassing:

- definition of the terms: biogas, producer gas, biofuels, feedstock, gross and net calorific values.
- biofuels and their specific energy contents
- method of production of one of these five biofuels including: source of raw material/feedstock, conversion process, yield
- applications for each of the biofuels.
- assessment of the biomass resource required to meet a particular energy service e.g. cooking, hot water, space heat, transport, process heat, electricity.
- social, political and economic impact of large scale use of selected biomass resources.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the

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workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out basic repairs to renewable energy apparatus by replacement of components as described in 8) and including:

A	Following manufactures service instructions for access to components
B	Removing at least three different types of components specified in the work instructions
C	Replacing components to manufacturer requirements.
D	Reassembling the apparatus correctly.
E	Testing apparatus operation
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to carrying out basic repairs to renewable energy apparatus by replacement of components.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to carrying out basic repairs renewable energy apparatus limited to replacement or repair of components in which the fault has been previously established. This must include at least two different renewable energy apparatus in which three different types of components are faulty one of which is mechanical.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK124A Solve basic problems in micro hydro systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers providing known solutions to predictable problems in micro hydro apparatus and systems operated at ELV and LV. It encompasses working safely, problem solving procedures, including the use of basic voltage, current and resistance measuring devices, providing known solutions to predictable circuit problems.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltages above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Note.

Competency requirements to be granted a license to carry out installations, fault finding, repair or maintenance on

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License to practice **3)**

low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Note: Those holding an ‘Unrestricted Electrician’s Licence’ or equivalent issued in an Australian State or Territory meet the pre-requisite requirements of this unit.

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the

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Prerequisite Unit(s) **4)**

workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on micro hydro systems	1.1	OHS procedures for a given work area are obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed
	1.3	The nature of the apparatus problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve problem in micro hydro systems	2.1	OHS risk control work measures and procedures are followed
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Established routines are used to solve micro hydro problems using measured and calculated values of apparatus operating parameters
	2.5	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with established procedures
	3.3	Justification for solutions used to solve micro hydro problems is documented
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established routine procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and solving basic problems in micro hydro systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK124A Micro hydro systems

Evidence shall show an understanding of micro-hydro systems to an extent indicated by the following aspects:

System components and configuration encompassing:

- structural differences between the Pelton, Turbo Impulse, Francis, and propeller type, Michell or Banki cross flow turbines and PATs (Pumps As Turbines).
- system configuration for each turbine type identifying all major components.
- for impulse and cross flow turbine types, the comparison of bucket and blade shapes, nozzle shapes and types, types of hydraulic and electrical controllers/governors, speed increasers and over speed clutches and their basic operation and appropriate application.
- operational parameters and efficiency of different turbines.

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REQUIRED SKILLS AND KNOWLEDGE

- circumstances under which battery storage would be used.
- respective merits and suitability of various turbine types for various micro hydro-electric applications.
- operation of hydraulic rams or similar water pumps.
  - typical efficiencies of hydraulic ram systems and appropriate applications.
- advantages and disadvantages of water energy storage systems with other energy storage systems such as battery banks.

Micro-hydro systems standards encompassing:

- Relevant Australian Standards AS/NZS3000, AS4509, and AS4086.2 requirements for associated with the installation, maintenance and operation of micro-hydro small scale generation units

Micro-hydro systems drawings encompassing:

- Schematic and wiring diagrams for the MHS showing the general circuit layout and protection between the MHS, batteries, inverter and loads.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to

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include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve basic problems in micro hydro systems as described in 8) and including:

A	Understanding the nature of the problem
B	Using established routines to solve apparatus/system problems
C	Providing viable solutions to apparatus/system problems.

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D	Documenting justification for the solutions used
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving basic problems in micro hydro systems

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG101A	Solve problems in electromagnetic devices and related circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to micro hydro systems as they apply to problems related to installation, fault finding, maintenance or development work functions in any of the following:

- In relation to at least three of the following types of micro hydro systems problems and on at least two occasions:
  - determining the operating parameters of an existing apparatus/system
  - identifying and locating electrical faults
  - identifying and locating mechanical fault

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK125A Solve basic problems in photovoltaic energy apparatus and systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers providing known solutions to predictable problems in photovoltaic energy apparatus and systems operated at ELV and LV. It encompasses working safely, problem solving procedures, including the use of basic voltage, current and resistance measuring devices, providing known solutions to predictable circuit problems.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltages above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Note.

Competency requirements to be granted a license to carry

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License to practice **3)**

out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Note: Those holding an ‘Unrestricted Electrician’s Licence’ or equivalent issued in an Australian State or Territory meet the pre-requisite requirements of this unit.

UEENEEE104A	Solve problems in d.c. circuits
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work

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Prerequisite Unit(s) **4)**

AND

UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

OR

UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on photovoltaic energy apparatus and systems	1.1	OHS procedures for a given work area are obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed
	1.3	The nature of the apparatus problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve problem in photovoltaic energy apparatus and systems	2.1	OHS risk control work measures and procedures are followed
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Established routines are used to solve photovoltaic energy apparatus problems using measured and calculated values of apparatus operating parameters
	2.5	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with established procedures
	3.3	Justification for solutions used to solve photovoltaic energy apparatus problems is documented
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established routine procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and solving basic problems in photovoltaic energy apparatus and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK125A Photovoltaic power systems

Evidence shall show an understanding of photovoltaic power systems to an extent indicated by the following aspects:

T1 Daily irradiation encompassing:

- definition of the terms: declination angle, reflectance, sunshine hours, extraterrestrial irradiation, Latitude, direct and diffuse radiation, azimuth and altitude angles, radiance, solar window, tilt angle, solstice, equinox
- units and symbols for irradiation and irradiance
- interpretation of solar radiation data tables and contour maps.
- measuring solar irradiance with a solarimeter.
- how radiation varies throughout the year on the surface of a fixed collector.
- determining, using field measurements and a sun path

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REQUIRED SKILLS AND KNOWLEDGE

diagram, the times and dates when a PV array will be shaded by obstacles at a particular site.

- calculation of the daily average irradiation on a horizontal plane given extraterrestrial irradiation, location constants and sunshine hour data.
- calculation of the monthly mean daily irradiation falling on a PV array for each month of the year, adjusted for the effects of shading, using irradiance and irradiation data tables and a sun path diagram and/or appropriate software.
- selection of an appropriate tilt angle for fixed and seasonally-adjustable PV arrays at an given latitude

T2 Photovoltaic modules encompassing:

- definition of the terms: cell, module, array, mono-crystalline, poly-crystalline, amorphous, band gap energy, semi-conductor
- diagram of a basic crystalline silicon PV cell, showing its physical structure, with at least five major features labelled
- major steps in the production of PV modules based on bulk silicon cells, in comparison with the production of thin film PV modules.
- basic physical principles of PV cell operation for the main types of commercially available PV modules.
- efficiency, spectral response, cost and typical applications of the main types of commercially available PV modules.
- new photovoltaic technologies currently being developed towards commercialisation, and their major features.
- mechanical and electrical features necessary for the long life of a PV module under a wide range of operating conditions.

T3 Module characteristics encompassing:

- definition of the terms: I-V curve, fill factor, operating point, maximum power point (MPP), cell temperature co-efficient, nominal operating cell temperature (NOCT), current, voltage and power output co-efficient.
- equivalent circuit for a PV cell, labelling each of the elements and the polarity of the terminals.
- family of I-V curves for a PV module, labelling major points and showing the effects of variation in irradiance and variation in cell temperature.
- major ratings of a PV module from manufacturer’s information or nameplate data.
- determination of the operating point of a PV module with a

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REQUIRED SKILLS AND KNOWLEDGE

resistive load, a constant voltage source or any other load with known I-V characteristics, using the load line method.

- configuration of a typical PV array, including the function, placement and ratings of blocking and bypass diodes.
- the effect of partial shading of a PV module or array, the impact of bypass diodes and the significance of their configuration on output current in typical operating conditions.
- calculation of the power at MPP, and the power under typical battery charging conditions, of a PV module, given irradiance and ambient air temperature.
- calculation of the daily energy output of a PV array in accordance with AS 4509.2, and by using "rule of thumb" de-rating factors.
- the scope and content of Australian or international standards relevant to the performance of PV modules.
- the electrical characteristics of a PV module according to relevant Australian or International standards, using an outdoor test method.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work

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environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace

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procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
    - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
    - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
    - Demonstrate an appropriate level of skills enabling employment
    - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
    - Solve basic problems in photovoltaic energy apparatus and systems as described in 8) and including:

A	Understanding the nature of the problem
B	Using established routines to solve apparatus problems
C	Providing viable solutions to apparatus problems.
D	Documenting justification for the solutions used
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

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These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving basic problems in photovoltaic energy apparatus.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to photovoltaic energy apparatus as they apply to problems related to installation, fault finding, maintenance or development work functions in any of the following:

- In relation to at least three of the following types of photovoltaic energy problems and on at least two occasions:
  - determining the operating parameters of an existing apparatus
  - identifying and locating electrical faults
  - identifying and locating mechanical fault

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK127A Diagnose and rectify faults in renewable energy control systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers diagnosing and rectifying faults in renewable energy control systems. It encompasses working safely, reading circuit diagrams, sketching diagrams from traced wiring, logically applying fault finding procedures, conducting repairs and completing the necessary service documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltages above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Note.

Competency requirements to be granted a license to carry out installations, fault finding, repair or maintenance on

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License to practice **3)**

low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to Diagnose and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control measures and procedures are followed in preparation for the work
	1.3	The likely extent of work to be undertaken is envisaged from fault/breakdown reports and/or discussions with appropriate person(s)
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Tools, equipment and testing devices needed to locate faults are obtained in accordance with established procedures and checked for correct operation and safety
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel
	2.5	Fault finding is approached methodically drawing on knowledge of renewable energy systems and interconnecting circuits using measured and calculated values of circuit/apparatus parameters
	2.6	Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage
	2.7	Faulty circuits/components are rechecked and their fault status and confirmed
	2.8	Materials/replacement parts required to rectify faults are sourced and obtained in accordance with established procedures
	2.9	Effectiveness of the repair is tested in accordance with established procedures
	2.10	Apparatus is reassembled, finally tested and prepared for return to service
	2.11	Unexpected situations are dealt with safely and with the approval of an authorised person

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ELEMENT		PERFORMANCE CRITERIA	
		2.12	Fault finding and repair activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices
3	Completion and report fault finding and repair activities.	3.1	OHS work completion risk control measures and procedures are followed
		3.2	Work area is cleaned and made safe in accordance with established procedures
		3.3	Written justification is made for repairs to apparatus
		3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and diagnosing faults in renewable energy control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK127A **Renewable energy system electronics**

Evidence shall show an understanding of renewable energy systems fault finding to an extent indicated by the following aspects:

Fault finding techniques encompassing:

- Factors to consider in clarifying the nature of a fault encompassing:
  - Initial fault report
  - Confirmation of symptoms of the fault
  - Comparison of symptoms with normal operation

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REQUIRED SKILLS AND KNOWLEDGE

- Effect to cause reasoning — assumptions of possible causes
- Methods for testing assumptions encompassing:
  - Visual inspection
  - Sectional testing
  - Split-half tests
  - Component isolation
- Dealing with intermittent faults

Semiconductor components encompassing:

- symbols for common semiconductor components including rectifier diodes, LEDs, zener diodes, bipolar transistors, Darlington pairs, MOSFETs, IGBTs, SCRs, and triacs.
- basic function of these devices above.
- major rating parameters of device above.
- applications for each device.
- I-V characteristics of diodes and the current gain characteristic of bipolar transistors.

T3 Linear regulated d.c. power supplies encompassing:

- label circuit diagrams for half wave and full wave, single phase and three phase rectifiers.
- voltage and current waveforms for these rectifier circuits with and without capacitor filtering
- peak output voltages from single phase and three phase rectifier circuits.
- block diagram showing the structure of a regulated DC power supply.
- main features of linear integrated circuit voltage regulator ICs.
- each of the major components and their physical location in a regulated power supply.

T4 Switching power control circuits encompassing:

- power dissipation of a transistor when operated as a switch.
- how Pulse Width Modulation (PWM) can provide a variable output voltage from a switch mode regulator.
- advantages and disadvantages of switch mode power circuits compared with linear power circuits.
- block diagram of a basic PV switching voltage regulator for battery charging.
- applications of switch mode circuits found in renewable energy systems.

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REQUIRED SKILLS AND KNOWLEDGE

- how power control in AC circuits is achieved using SCRs and Triacs.
- methods used to reduce radio frequency interference (RFI) in DC and AC circuits utilising high speed switching.

T5 Digital electronic circuits encompassing:

- characteristic features that distinguish analogue and digital devices and circuits.
- how numbers or text information can be represented using binary numbers and how these are represented in digital circuits.
- operation of voltage comparators, Analogue to Digital (A-D) converters, and Digital to Analogue (D-A) converters, and give one example of each one's use in a renewable energy application.
- basic function of microcontrollers, volatile and non-volatile memory devices.
- operation of a solar hot water system pump differential controller, as an example of the use of logic in digital circuits.

T6 Inverters encompassing:

- basic function of inverters and d.c.- d.c. converters and their use in renewable power systems.
- the operation of an inverter bridge and half-bridge.
- output voltage waveforms for square wave, modified square wave and synthesised sine wave inverters showing typical voltages and timing.
- the function of PWM techniques in modified square wave and synthesised sine wave inverters.
- block diagrams showing the structure of common forms of d.c.-d.c. converters and inverters used in renewable energy applications

T7 Maintenance encompassing:

- safety procedures for work on electronic systems, circuits and apparatus.
- hazards that may be encountered when performing tests on inverters, battery chargers or other equipment containing LV circuits.
- functionality of electronic equipment through appropriate client questioning and application of systematic tests and observation.
- various types of common faults and their causes in renewable

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REQUIRED SKILLS AND KNOWLEDGE

energy electronic equipment.

- typical test equipment used to repair electronic and electrical equipment
- safe and correct use of tools and test equipment to locate electronic equipment faults under the direction of an electronics technician.
- replacement of circuit boards, observing appropriate handling precautions for static sensitive devices.
- replacement of socketed ICs such as EPROMs or microprocessors, using appropriate tools and methods

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in renewable energy control systems as described in 8) and including:

A	Envisaging the likely extent of work from fault/breakdown reports and discussion with appropriate persons
B	Using methodical fault finding techniques
C	Finding faults efficiently
D	Rectifying faults effectively
E	Completing documentation correctly
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved

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industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing faults in renewable energy control systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to finding and repairing any four of the following faults in renewable energy systems:

- Open-circuit
- Short-circuit
- Incorrect connections
- Insulation failure
- Unsafe condition
- Apparatus/component failure
- Related mechanical failure

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK128A Solve problems in stand-alone renewable energy systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers providing known solutions to predictable problems in stand-alone renewable energy systems operated at extra-low voltage. It encompasses working safely, problem solving procedures, including the use of basic voltage, current and resistance measuring devices, providing known solutions to predictable circuit problems.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltages above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Note.

Competency requirements to be granted a license to carry

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License to practice **3)**

out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK123A	Carry out basic repairs to renewable energy apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 3 Writing 3 Numeracy 3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on stand-alone renewable energy systems	1.1	OHS procedures for a given work area are obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed
	1.3	The nature of the apparatus problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others
	1.5	Sources of materials that may be required for the work are identified and accessed in accordance

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ELEMENT		PERFORMANCE CRITERIA	
			with established procedures
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2	Solve problem in stand-alone renewable energy systems	2.1	OHS risk control work measures and procedures are followed
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Established routines are used to solve stand-alone renewable energy systems problems using measured and calculated values of apparatus operating parameters
		2.5	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed
		3.2	Work site is cleaned and made safe in accordance with established procedures
		3.3	Justification for solutions used to solve stand-alone renewable energy systems problems is documented
		3.4	Work completion is documented and appropriate person(s) notified in accordance with established routine procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and solving basic problems in stand-alone renewable energy systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK128A Stand alone renewable energy system components

Evidence shall show an understanding of stand-alone RE system components to an extent indicated by the following aspects:

T1 ELV wiring and circuit protection for renewable power systems encompassing:

- extra low voltage (ELV) and low voltage (LV) circuits in a stand-alone or grid connected renewable power system and the regulatory restrictions regarding work at each level.
- earthing requirements for renewable power systems over a range of applications and environments
- required sizes for ELV cabling in a renewable power system, considering allowable voltage drops and cable current carrying capacity, in accordance with AS/NZS 3000 and AS 4509.
- Selection of suitable d.c. circuit protection and isolation for all relevant points in a stand-alone renewable power system, in accordance with AS/NZS 3000 and AS 4509

T2 Electrical diagrams for a renewable power system encompassing:

- functional block diagrams for typical stand-alone renewable power system configurations.
- circuit schematic of typical renewable power systems supplying d.c. and/or a.c. loads, including all major components, protection devices, earthing, isolation, switching and metering
- unit wiring diagram for a typical renewable stand-alone power system d.c. control board
- architectural and site diagrams to show the locations of equipment, fittings and cabling

T3 Batteries encompassing:

- major features of each of the major types of commercially

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REQUIRED SKILLS AND KNOWLEDGE

available batteries for stand-alone power system applications including basic chemistry, physical structure, advantages and disadvantages

- factors affecting the life of a battery
- processes of sulphation and stratification in lead acid batteries, their causes, effects and methods of prevention or reduction.
- effect of depth of discharge and of temperature on the capacity and life of lead-acid batteries.
- major specifications for a lead-acid battery in a stand-alone power system application.
- main features of charging regimes suitable for the major types of stand-alone power system batteries, using real examples.
- life of a standalone power system battery in years, based on manufacturer's cycle life data and given capacity, configuration and operating conditions
- precautions required when handling, installing or maintaining lead-acid batteries.
- procedures required for safe disposal of the major commercially available types of batteries in accordance with AS 4509.

T4 Balance of system components and common loads encompassing:

- features of commercially available inverters suitable for use in stand-alone power systems.
- major operating parameters of an inverter, including d.c. voltage operating window; efficiency, output voltage waveform and output voltage regulation over a range of loads up to 5 minute ratings.
- problems that may be caused by non-sine supply voltage waveforms on typical loads, and the solutions used to overcome these
- significance of low power factor loads for inverter systems and the principle of power factor correction.
- operation of the major types of regulators for use in stand-alone renewable power systems, using commercially available equipment as examples.
- current vs. voltage characteristics, efficiency and charging voltage waveform for a transformer/rectifier type and a switchmode type battery charger suitable for use in stand-alone renewable power systems.

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REQUIRED SKILLS AND KNOWLEDGE

- operation of and applications for MPPTs for photovoltaic arrays.
- basic operation, advantages and disadvantages of mechanical tracking devices for PV arrays.
- control parameters or data using digital displays on inverters, regulators or controllers

T5 Basic lighting design encompassing:

- properties and features of the major lamp types including their suitability for use in stand-alone PV power systems.
- effect on room lighting levels, of luminaire design and positioning, décor, room construction and windows.
- Selection and sizing of suitable lamps and fittings and their placement in a household taking into account usage, lighting levels required by relevant standards and energy efficiency considerations.

T6 Generating sets encompassing:

- major components in the construction of a generating set
- main components of gas, petrol or diesel internal combustion engines
- basic principle of operation of internal combustion engines, including different fuel types and ignition methods.
- operating characteristics, advantages and disadvantages of gensets using different fuel types, aspiration methods, operating speed and number of cylinders.
- major methods of mechanical coupling and power transmission between an engine and alternator
- function and ratings of mechanical and electronic speed governing systems.
- basic structure and operation of an alternator.
- advantages and disadvantages of different types of excitation system and voltage regulation used for genset alternators.
- components and basic operation of a brushless excitation system in an alternator, and the principle of self-excitation

T7 Generator set sizing calculations encompassing:

- major electrical and mechanical ratings which control the performance of a genset
- calculations relating to real and apparent power, power factor, mechanical power, voltage regulation and speed droop for single phase gensets
- derating factor for a genset given manufacturer’s derating

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REQUIRED SKILLS AND KNOWLEDGE

data and a given set of operating conditions.

- Selection of a suitable genset given maximum demand and surge loadings and derating factor.
- Calculation of the fuel consumption of a genset given manufacturer's data and operating conditions

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining

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competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve basic problems in stand-alone renewable energy systems as described in 8) and including:

A	Understanding the nature of the problem
B	Using established routines to solve apparatus problems
C	Providing viable solutions to apparatus problems.
D	Documenting justification for the solutions used
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving basic problems in stand-alone renewable energy systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to stand-alone renewable energy systems as they apply to problems related to installation, fault finding, maintenance or development work functions in any of the following:

- In relation to at least three of the following types of stand-alone renewable energy system problems and on at least two occasions:
  - Open-circuit
  - Short-circuit
  - Incorrect connections
  - Insulation failure
  - Unsafe condition
  - Apparatus/component failure
  - Related mechanical failure

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK129A Design renewable energy (RE) heating systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design of renewable energy heating systems and their installation. It encompasses following design briefs, incorporating schemes for protection of persons and property from dangers of system malfunction, ensuring other safety and performance standards and functional requirements are meet and documenting design calculations and criteria.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK128A	Solve problems in stand-alone renewable energy systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design renewable energy heating systems.	1.1	OHS procedures for a given work area are obtained and understood
	1.2	The extent and nature of the electrical installation is determined from design brief
	1.3	Safety and other regulatory requirements to which the electrical installation must comply are obtained and understood
	1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the installation or associated work
2 Develop renewable energy heating systems design.	2.1	Knowledge of renewable energy heating systems performance standards, compliance methods is applied to the design
	2.2	Alternative arrangements for the heating systems design are considered based on the requirements outlined in the design brief
	2.3	Safety, functional and budgetary considerations are incorporated in the design
	2.4	Heating systems design draft is checked for compliance with the design brief and regulatory requirements
	2.5	Heating systems design is documented for submission to appropriate persons for acceptance and approval
	2.6	Solutions to unplanned situation are provided consistent with organisation policy
3 Obtain approval for renewable energy heating systems design.	3.1	Heating systems design is presented and explained to client representative and/or other relevant persons
	3.2	Requests for alterations to the design are negotiated with relevant persons within the constraints of organisation policy

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Final design is documented and approval obtained from appropriate persons.
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and designing renewable energy heating systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK129A Renewable energy heating - design

Evidence shall show an understanding of the design of renewable energy heating to an extent indicated by the following aspects:

T1 Heat transfer encompassing:

- Modes of heat transfer
- Conduction through a flat plate, series flat plates, thick and thin wall pipe, composite pipes (e.g. lagged pipes and drums)
- Convection at a flat surface or tube
- Radiation from a flat surface or tube for black or grey bodies
- Combined conduction and convection through single or multiple flat plates or thin wall tubes
- Combined convection and radiation
- Combined conduction, convection and radiation such as fluid in a tank (convection to wall), through wall and/or insulation (conduction) to outside air (convection and radiation)
- Heat exchangers - parallel, counter flow and cross flow

T2 Combustion and fuels encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- The combustion process
- Fuels - desirable and undesirable characteristics, solid, liquid and gaseous types, their relative advantages and disadvantages and common methods of combustion
- Air/fuel ration - stoichiometric excess or insufficient air
- Emissions and pollutants and their control
- Combustion equations - element mass balance
- Combustion products - gravimetric basis

T3 Steam encompassing:

- Importance of steam for heat transfer and power production
- Steam/water properties and the inter-relationship between the various properties for unsaturated or saturated water or steam either superheated, saturated or wet
- Saturation temperature and pressure, specific enthalpy, specific volume, dryness fraction
- Temperature-specific enthalpy diagram for steam/water
- Use of steam table to determine steam/water properties (any condition except supercritical)
- Steam generation - water tube and fire tube boilers, boiler efficiency
- Safety devices and controls used with boilers
- Steam plant - steam traps, economiser, air, pre-heater, superheater, air/water separators, water treatment, feedwater pump, exhaust gas treatment
- Heat transfer rates to or from steam/water (any condition except supercritical)
- Steam throttling and formation of flash steam
- Steam heat exchangers and barrel calorimeters
- Steam plant for process heating
- Steam plant for power production

T4 Refrigeration/heat pump encompassing:

- Basic principles and terminology
- Vapour compression cycle
- Performance criteria
- Types of refrigerant - designation, properties advantages and disadvantages
- Refrigerant properties using the p-h diagram
- Ideal vapour compression cycle on the p-h diagram
- Energy balance and heat transfers in compressor, evaporator

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REQUIRED SKILLS AND KNOWLEDGE

and condenser

- Actual vapour compression cycle and variations from the ideal - pressure loss in lines and non-ideal compression
- Superheating and subcooling with or without suction/liquid heat exchanger
- Carnot principle applied to refrigerator and heat pump Principles of evaporative refrigeration, absorption refrigeration, air cycle refrigeration and thermo-electric refrigeration

T5 Daily irradiation encompassing:

- definition of the terms: declination angle, reflectance, sunshine hours, extraterrestrial irradiation.
- solar radiation data tables and contour maps.
- determination, using field measurements and a sun path diagram, the times and dates when a PV array will be shaded by obstacles at a particular site.
- calculation of the daily average irradiation on a horizontal plane given extraterrestrial irradiation, location constants and sunshine hour data.
- calculation of the monthly mean daily irradiation falling on a PV array for each month of the year, adjusted for the effects of shading, using irradiance and irradiation data tables and a sun path diagram and/or appropriate software.

T6 Energy balance encompassing:

- definitions of the terms: transmittance, absorptance, emittance, specific heat, absorber, heat removal factor, stagnation temperature.
- explain the heat transfer mechanisms of conduction, convection and radiation and their operation in a simple fin and tube collector.
- how the transmittance, absorptance and emittance properties of materials used in the collector affect the performance of the collector.
- ways to reduce heat losses from a collector.
- energy balance and instantaneous efficiency equations for a collector.
- calculation of the collector constants from the instantaneous collector efficiency equation for a linear relationship.

T7 The solar collector encompassing:

- five major factors that affect the selection of materials for

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REQUIRED SKILLS AND KNOWLEDGE

solar collectors.

- features of collectors for low, medium and high temperature applications in terms of heat transfer, optical properties and materials of construction.
- the scope and content of AS 2712 or similar standards.
- requirements of AS 2712 or similar standards in one aspect of collector construction.
- tests required by AS 2712 or similar standards with regard to collector construction.

T8 Solar collector performance encompassing:

- scope and content of Australian Standards AS 2535 and AS 2984 or similar standards.
- method for testing the thermal performance of a solar collector or a solar water heater according to AS 2535 and AS 2984 or similar standards.
- instantaneous efficiency of a solar collector for different inlet temperatures and flow rates.
- effect of varying inlet temperature and flow rate on the performance of a solar collector.
- efficiency curves for various types of solar collectors.
- performance of various types of solar water heaters in terms of their design, location and predicted solar fraction

T9 Hydraulic circuits encompassing:

- definition of the terms: equivalent length, static head, dynamic head, heat exchanger.
- configuration of a hydraulic circuit for a pumped storage solar water heating system.
- function of the components in the circuit.
- effects of water quality on the life and performance of components in the hydraulic circuit.
- suitable type and size components to minimise hydraulic and energy losses including pipes, pumps, heat exchangers, expansion tanks, valves and filters for a hydraulic circuit with a given flow rate and head.
- safety requirements of the hydraulic circuit in terms of temperature, pressure and hydrogen gas release.
- requirements to balance flow through parallel/series combinations of collector arrays.
- suitable water and energy conservation measures including user education, water conservation technologies and

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REQUIRED SKILLS AND KNOWLEDGE

insulation.

- suitable types and level of insulation for system components to minimise heat losses.

T10 Domestic solar water heaters encompassing:

- definition of the terms: thermosiphon system, pumped storage system, sacrificial anode.
- function of the components in a domestic solar water heater including the collector, storage tank, valves, piping, differential controllers, pumps, insulation and support frames.
- schematic diagram of different types of system configurations showing collectors, storage tank, piping, pumps, filters, valves, heat exchangers and expansion tanks.
- factors which affect system performance including: storage tank and collector design, system location and collector orientation, water quality, hot water demand, usage pattern.
- safety requirements that prevent injury from high temperature water and hydrogen gas explosions during installation, maintenance and use of solar water heaters.
- demand for hot water and irradiation for a given location and collector tilt angle, orientation and shading.
- selection a suitably sized system for a given demand and location to meet a specific solar fraction and/or minimise life cycle cost.
- consequences of under/oversizing of solar water heating systems in terms of: the effect on system performance, safety, life expectancy of components.
- installation, commissioning and maintenance requirements for a given situation including location and mounting of collectors, storage tanks, valves, pumps, pipes and ancillary fittings.
- energy conservation and efficiency measures that will enhance the performance of a solar water heater such as: appropriate usage patterns, insulation, water conservation technologies, auxiliary energy tariffs.
- the capital cost, simple pay back and life cycle cost of solar and electric or gas hot water heaters according to AS3595 and AS4536.

T11 Commercial solar hot water heaters encompassing:

- schematic diagrams for two different types of system configurations showing collectors, storage tank, piping, pumps, filters, valves, heat exchangers and expansion tanks.

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REQUIRED SKILLS AND KNOWLEDGE

- steps involved in the design of a commercial solar water heating system.
- assessment of the demand for hot water and irradiation for a given location and collector tilt angle, orientation and shading.
- selection of a suitably sized system for a given demand and location to meet a specific solar fraction and/or minimise life cycle cost.
- consequences of under/oversizing of a solar water heating system in terms of: system performance, safety, life expectancy of components.
- installation, commissioning and maintenance requirements for a given situation including location and mounting of collectors, storage tanks, valves, pumps, pipes and ancillary fittings.
- evaluation of energy conservation and efficiency measures that will enhance the performance of a solar water heater such as: appropriate usage patterns, insulation, water conservation technologies, auxiliary energy tariffs.
- the capital cost, simple payback time and life cycle cost of solar and electric or gas hot water heaters according to AS3595 and AS4536.

T12 Pool solar hot water heaters encompassing:

- function of the components of solar pool heating systems.
- typical system configuration.
- two factors which affect system performance

T13 Heating system technologies encompassing:

- Types and their application
- Operating parameters of common systems
- System component parameters and specifications
- System performance and requirements
- Installation specifications and requirements

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design renewable energy heating systems as described in 8) and including:

A Developing outlines of alternative designs,

B Developing the design within the safety and functional requirements and budget limitations,

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C	Documenting and presenting design effectively,
D	Successfully negotiating design alteration requests
E	Obtaining approval for final design
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing renewable energy heating systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended

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primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 1A Use computer applications relevant to a workplace

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing renewable energy heating systems and their installation.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK130A Solve problems in wind energy conversion systems rated up to 10 kW

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers providing known solutions to predictable problems in wind energy conversion systems rated up to 10 kW. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing known solutions to predictable circuit problems

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltages above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Note.

Competency requirements to be granted a license to carry

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License to practice **3)**

out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEE104A	Solve problems in d.c. circuits
UEEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work on wind energy conversion systems	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	The nature of the apparatus problem is obtained

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ELEMENT		PERFORMANCE CRITERIA	
			from documentation or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2	Solve problem in wind energy conversion systems	2.1	OHS risk control work measures and procedures are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures
		2.4	Established routines are used to solve wind energy conversion systems problems using measured and calculated values of apparatus operating parameters.
		2.5	Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Complete work and document problem solving activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Justification for solutions used to solve wind energy conversion systems problems is documented.

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Work completion is documented and appropriate person(s) notified in accordance with established routine procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and solving problems in wind energy conversion systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK130A Types, construction and operating features of small WECS

Evidence shall show an understanding of small WECs types, construction and operating features to the extent indicated by the following aspects:

T1 Basic operation of lift and drag type WECS

T2 Characteristics of WECS in terms of power and torque, efficiency (power and output co-efficient), solidity and tip speed ratio.

T3 Major categories and sub-categories of WECS.

T4 Advantages and disadvantages of each type of WECS.

T5 Suitable materials for the construction of WECS taking into consideration fatigue stresses and environmental conditions such as salt air, humidity and ice.

T6 Typical system configurations and components for: stand-alone power systems and water pumping.

T7 Strategies and/or mechanisms to control: mechanical stresses on the WECS in gale force winds and power output for battery charging.

T8 Appropriate types of WECS for a particular application

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and

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developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in wind energy conversion systems as described in 8) and including:

A Understanding the nature of the problem

B Using established routines to solve apparatus

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	problems
C	Providing viable solutions to apparatus problems.
D	Documenting justification for the solutions used
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in wind energy conversion systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended

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primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to wind energy conversion systems as they apply to problems related to installation, fault finding, maintenance or development work functions in any of the following:

- In relation to at least three of the following types of wind energy conversion system problems and on at least two occasions:
  - determining the operating parameters of an existing apparatus
  - identifying and locating electrical fault
  - identifying and locating mechanical fault

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK131A Design wind energy conversion systems (WECS) rated to 10 kW

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the design of wind energy conversion systems and their installation. It encompasses following design briefs, incorporating schemes for protection of persons and property from dangers of system malfunction, ensuring other safety and performance standards and functional requirements are meet and documenting design calculations and criteria.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK130A	Solve problems in wind energy conversion systems rated to 10 kW
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE101A	Apply occupational health and safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills	**5)**
	will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design wind energy conversion systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	The extent and nature of the system is determined from design brief
		1.3	Safety and other regulatory requirements to which the electrical installation must comply are identified, obtained and understood
		1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the installation or associated work
2	Develop wind energy conversion systems design.	2.1	Knowledge of wind energy conversion systems performance standards, compliance methods is applied to the design
		2.2	Alternative arrangements for the wind energy systems design are considered based on the requirements outlined in the design brief
		2.3	Safety, functional and budgetary considerations are incorporated in the design
		2.4	Wind energy system design draft is checked for compliance with the design brief and regulatory requirements

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Wind energy system design is documented for submission to appropriate persons for acceptance and approval
	2.6	Solutions to unplanned situation are provided consistent with organisation policy
3 Obtain approval for wind energy conversion systems design.	3.1	Wind energy system design is presented and explained to client representative and/or other relevant persons
	3.2	Requests for alterations to the design are negotiated with relevant persons within the constraints of organisation policy
	3.3	Final design is documented and approval obtained from appropriate persons
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and designing wind energy conversion systems rated to 10 kW.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK131A Design of small wind energy conversion systems (WECS)

Evidence shall show an understanding of the design of small wind energy conversion systems (WECS) to the extent indicated by the following aspects:

T1 Wind characteristics encompassing:

- definition of the terms: weather charts, isobars, fronts and troughs, cyclone and anti-cyclone, atmospheric boundary

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REQUIRED SKILLS AND KNOWLEDGE

layer, geotropic wind, gradient wind, wind shear, wind rose

- major global wind circulations and the formation of major wind flows over your continent.
- major features of the atmospheric boundary layer including: variation of wind speed with height according to logarithmic and power Laws, effects of surface roughness
- atmospheric stability and temperature inversions turbulence.
- major local winds including: trade winds, sea and land breezes, katabatic and anabatic winds.
- likely effects on the major local winds from local topography, surface roughness, isolated barriers and temperature inversions.
- typical diurnal, monthly and seasonal patterns of winds over the local area.
- the formation and likely effects of extreme winds and wind shear.

T2 Wind speed data measurement and analysis encompassing:

- definition of the terms: porosity, internal boundary layer, speed-up factor, temperature inversion factor, wind speed frequency distribution, lull period, calms.
- interpretation of local and regional wind speed and direction data such as local records (E.g. Meteorological Bureau data), ecological indicators and wind speed/energy maps.
- wind speed and direction using data logging anemometers.
- manufacturer's calibration curves for anemometers to correct recorded data.
- calculation at a site, monthly and yearly average wind speed , and wind power density from existing, nearby data or on-site measurements, using appropriate software
- estimation of the wind speed at a WECS tower of suitable height and location given: wind speed data recorded at two or more elevations at the site, and wind speed data recorded at one elevation and appropriate surface roughness, temperature inversion and speed-up factors at the site.

T3 Site selection encompassing:

- the likely effects of local topography, surface roughness, isolated barriers and temperature inversions on a WECS at a given site.
- assessment of available local or regional wind speed, wind energy and direction data.
- selection of the most appropriate site-monitoring location

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REQUIRED SKILLS AND KNOWLEDGE

taking into consideration factors such as: topography, accessibility, surface roughness, shielding from isolated barriers (obstacles), turbulence, temperature inversions, power transmission distance , environmental and heritage impacts e.g. noise, visual, bird life, national parks or aboriginal sites.

- measurement of wind speed and direction data at an appropriate site and height(s) using a data logging anemometer over a sufficient period of time.
- analysis of the recorded wind speed and direction data to determine if the site is suitable for wind energy utilisation.

T4 Selection of WECS encompassing:

- selection of suitable WECS specifications to suit site load and wind speed data according to AS4509 including: cut-in, rated and furling wind speeds, blade diameter, rated power at an appropriate rated wind speed, materials of construction.
- select a suitable commercially available WECS that most closely fits the specifications above.
- suitable tower requirements at the site including site access, soil type and foundations, structural certification and planning approvals.
- calculation of the monthly and annual energy output of the selected WECS at the site from wind speed data and load data using appropriate computer software and in accordance with AS4509.
- height of the tower and the size of the WECS for optimum use.
- suitable system configurations.
- balance of system components including: battery storage, inverter, regulator, transmission cable, back-up battery charger and generator.
- equipment reliability and manufacturer/suppliers back-up service including availability of spare parts and service personnel
- installed capital and life cycle costs of various system configurations according to AS3595 and AS4536.
- environmental, cultural and social factors that impact on the implementation of a WECS such as: external costs, WECS manufacturing processes and embodied energy and energy payback time, noise levels, visual amenity, RFI

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design wind energy conversion systems rated to 10 kW as described in 8) and including:

A Developing outlines of alternative designs

B Developing the design within the safety and functional requirements and budget limitations

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C	Documenting and presenting design effectively
D	Successfully negotiating design alteration requests
E	Obtaining approval for final design
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing wind energy conversion systems rated to 10 kW.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended

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primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 1A Use computer applications relevant to a workplace

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different wind energy conversion systems and their installation.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK132A Develop strategies to address environmental and sustainability issues in the energy sector

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers developing strategies to address environmental and sustainability issues in the energy sector. It encompasses working safely, apply extensive knowledge of sustainable energy systems and components and their operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting alternatives solutions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop strategies to address environmental and sustainability issues.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	The extent of the environmental and sustainability issues are determined from performance specifications and situation reports and in consultation with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
	1.5	Effective strategies are determined to ensure solution development and implementation is carried out efficiently
2 Develop strategies to address environmental and sustainability issues	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Knowledge of sustainability is applied to developing strategies to address greenhouse gas and sustainability issues
	2.3	Parameters, specifications and performance requirements in relation to environmental and sustainability issues are set in accordance with established procedures
	2.4	Approaches to resolving environmental and sustainability issues are analysed to provide most effective solutions
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards

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ELEMENT	PERFORMANCE CRITERIA	
3 Document strategies to address environmental and sustainability issues.	3.1	Solutions to environmental and sustainability issues are tested to determine their effectiveness and modified where necessary
	3.2	Adopted solutions are documented, including instructions for implementation that incorporates risk control measures to be followed
	3.3	Appropriately competent and qualified persons required to implement solutions to environmental and sustainability issues are coordinated in accordance with regulatory requirements and enterprise policy (See Note)
	3.4	Justification for strategies used to solve environmental and sustainability issues is documented for inclusion in work/project development records in accordance with professional standards

Note:

A licence or permit to practise in the workplace is required for specified work on building and premises

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and developing strategies to address sustainability issues.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK132A Environmental and Sustainability strategies

Evidence shall show an understanding of greenhouse reduction strategies to an extent indicated by the following aspects:

T1 Principles of sustainability encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- ways in which ecosystems moderate climate.
  ways in which ecosystems purify and store water.
- ways in which ecosystems recycle waste.

T2 Problems in a sustainable world encompassing:

- changes to Australian forest cover since white settlement, and the resulting loss of ecosystem and human benefits.
- changes to Australia‘s soils since white settlement, and the resulting loss of ecosystem and human benefits.
- changes to Australia‘s waterways since white settlement, and the resulting loss of ecosystem and human benefits.
- place of environmental accounting in quantifying Australia‘s environmental losses.
- limits to Australia‘s population carrying capacity.

T3 Sustainability principles encompassing:

- principles within sustainability including: environmental accounting and economies; full cost pricing; triple bottom line ethic; ecologically sustainable development; greenhouse gas abatement; energy efficiency; resource and water use efficiency; life cycle costing; renewable energy substitution, cleaner production; waste minimisation, reuse and recycling; ecological footprint.

T4 Addressing the problem of global warming encompassing:

- greenhouse gases and their sources and quantities that contribute to global warming.
- global warming impacts for Australia for 2030 and 2070 predicted by CSIRO modelling.
- requirements to achieve stable atmospheric concentrations of greenhouse gases.
- ecologically and economically sustainable methods for achieving these stable concentrations.

T5 Greenhouse gas emissions profile encompassing:

- goals and principles of the National Greenhouse Strategy
- what a greenhouse gas inventory is, why it is required, and the sectors to which it applies
- uses to which the National Greenhouse Gas Inventory can be applied.

T6 Understanding and communicating climate change and its impacts encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- the possible impact of climate change in Australia.
- techniques for improving the understanding of climate change
- techniques for communicating to and educating the general public on greenhouse gas induced climate change.

T7 Partnerships for greenhouse action encompassing:

- actions achievable by each level of government to implement the NGS.
- methods by which the community activity can be engaged in the reduction of greenhouse gas emissions.
- initiatives that can be undertaken by the private sector to reduce greenhouse gas emissions.
- advantages of international partnerships.
- emissions trading system.

T8 Efficient and sustainable energy use and supply encompassing:

- techniques for reducing the greenhouse intensity of energy supply.
- types of renewable energy sources suitable for use in Australia.
- methods and technique for improving end-use efficiency.

T9 Efficient transport and sustainable urban planning encompassing:

- how integrating land use and transport planning can assist the greenhouse problem.
- how each of the following can be used to mitigate greenhouse gas; travel demand and traffic management strategies; encouraging greater use of public transport, walking and cycling; freight and logistics systems; improving vehicle fuel efficiency and fuel technologies;

T10 Greenhouse sinks and sustainable land management encompassing:

- how enhancing greenhouse sinks and encouraging sustainable forestry and vegetation management can complement the AGS.
- how greenhouse gas emissions are obtained from agricultural production and describe techniques to mitigate the emissions.

T11 Models of greenhouse best practice in industrial processes

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REQUIRED SKILLS AND KNOWLEDGE

and waste management encompassing:

- types and methods of reducing greenhouse gas emissions from industry.
- methods of reducing methane emissions from waste treatment and disposal.

T12 Adaptation to climate change encompassing:

- salient points in each of the key sectors that require analysis and the strategies required in the need for adaptation to climate change

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop strategies to address environmental and sustainability issues as described in 8) and including:

A	Understanding the extent of the energy problem
B	Forming effective strategies for solution development and implementation
C	Obtaining energy system/component parameters, specifications and performance requirements appropriate to each problem
D	Testing solutions to energy problems
E	Documenting instruction for implementation of solutions that incorporate risk control measure to be followed
F	Documenting justification of solutions implemented in accordance with professional standards
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice

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using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing strategies to address environmental and sustainability issues.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to developing engineering strategies to address environmental and sustainability issues for at least four energy problems.

Note.

Typical sustainability issues are those encountered in meeting sustainability performance standards, such as reducing needs for energy use, reducing causes of greenhouse gas emissions, revising a energy system operating parameters and dealing with energy system efficiencies.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK133A Design hybrid renewable power systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the design of hybrid renewable power systems and their installation. It encompasses following design briefs, incorporating schemes for protection of persons and property from dangers of system malfunction, ensuring other safety and performance standards and functional requirements are meet and documenting design calculations and criteria.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK128A	Solve problems in stand-alone renewable energy systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to design hybrid power systems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	The extent and nature of the system is determined from design brief
		1.3	Safety and other regulatory requirements to which the electrical installation must comply are identified and understood
		1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the installation or associated work
2	Develop hybrid power systems design	2.1	Knowledge of hybrid power systems performance standards, compliance methods is applied to the design
		2.2	Alternative arrangements for the wind energy systems design are considered based on the requirements outlined in the design brief
		2.3	Safety, functional and budgetary considerations are incorporated in the design
		2.4	Wind energy system design draft is checked for compliance with the design brief and regulatory requirements
		2.5	Wind energy system design is documented for submission to appropriate persons for acceptance and approval
		2.6	Solutions to unplanned situation are provided consistent with organisation policy
3	Obtain approval for hybrid power systems design	3.1	Wind energy system design is presented and explained to client representative and/or other relevant persons
		3.2	Requests for alterations to the design are negotiated with relevant persons within the constraints of organisation policy

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Final design is documented and approval obtained from appropriate persons
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and designing hybrid renewable power systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK133A Hybrid Energy Systems - design

Evidence shall show an understanding of the design of hybrid energy systems to an extent indicated by the following aspects:

Energy demand encompassing:

- end-use services and energy demand for each service.
- most appropriate energy sources for each energy service for a given application and location, taking into consideration economic, environmental and client requirements.
- greenhouse gas savings from a hybrid energy system compared to an existing non-hybrid system, resulting from energy source switching and reduction in fuel usage.
- daily load profiles illustrating average demand and maximum demand, based on time of use data for all electrical loads
- daily load profiles based on given load data, with consideration of likely variations in usage patterns.
- load management strategies and or energy source switching options to reduce the maximum and surge demand, based on load profile analysis
- load profile using a.c. power logging equipment
- daily load profiles illustrating average demand and maximum demand, based on time of use data for all electrical loads

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REQUIRED SKILLS AND KNOWLEDGE

Hybrid energy system operation encompassing:

- Definition of the terms complementarily (in relation to renewable energy resources)
- availability
- advantages and disadvantages of hybrid energy systems.
- major features of typical system configurations including pure renewables; renewables and genset; series; switched; parallel (including those with nominal daily genset running)
- operation of a hybrid system over the short term (e.g. daily) and long term (e.g. seasonal, annual).
- response of a genset to a step change in load, and to an overload condition.
- calculations relating to real and apparent power, power factor, mechanical power, voltage regulation and speed droop for single and three phase gensets.
- Calculation of the average efficiency of a genset supplying a given daily load profile, given genset efficiency vs. load data.

System design encompassing:

- system design criteria in consultation with a client.
- renewable energy resources available at a site through the use of on-site measurements and pre-existing weather data as appropriate.
- Selection of a suitable hybrid power system configuration
- Selection and sizing of suitable renewable energy generators for a hybrid energy system taking into consideration available renewable energy resources and daily and seasonal load profiles consistent with AS 4509.2.
- Analysis of load data to determine preferred time of day for genset running, and required energy storage in a parallel hybrid system.
- Selection and sizing of a suitable genset for any system configuration, including a parallel system, according to AS 4509.2
- Selection and sizing of suitable balance-of-system components for a hybrid energy system including energy storage, controls and inverters consistent with AS 4509.2.
- Selection and sizing of a battery bank to meet both energy and maximum power demands in a parallel hybrid system, using an appropriate battery discharge rate and considering load data and genset running times
- Selection of an inverter for a parallel hybrid system,

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REQUIRED SKILLS AND KNOWLEDGE

considering load data, genset running times and battery charging requirement.

- Selection and sizing of suitable internal combustion generators (genset) for a hybrid energy system taking into consideration genset characteristics and de-rating requirements
- performance of the system given load data, resource data, equipment specifications, configuration and control strategy.
- Calculation of the load fraction contributed from each renewable energy generator and from the genset.
- Calculation of the genset run time and fuel usage
- Optimisation of the system design based on a mix of design criteria such as cost, availability and reliability, maintenance, environmental factors, convenience etc.
- system manual according to AS4509.3 and AS4509.2, given system components and design data

Life cycle costing encompassing:

- present worth of a future payment
- major costs in the life cycle of a hybrid energy system to be considered in life cycle costing.
- Selection of an appropriate discount rate, inflation rates, and life cycle for a hybrid system life cycle cost analysis.
- life cycle cost analysis including the cost of finance and tax savings for a hybrid system using computer software
- most cost effective of a number of hybrid energy system options on the basis of life cycle costing analysis according to AS4536, AS3595 or similar standards.
- Comparison of the capital cost, simple payback time and life cycle cost of a hybrid energy system with another energy supply option, according to AS 4536, AS 3595 or similar standards.
- sensitivity analysis of life cycle costing to variations in discount rate or other major parameters

Installation, commissioning and maintenance encompassing:

- Specification of the installation and maintenance requirements for a complete hybrid energy system taking into consideration safety and relevant Australian Standards
- installation requirements for fuel storage for a given genset in accordance with AS 1940, AS 4509 and local regulations
- considerations involved in providing adequate genset vibration isolation

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REQUIRED SKILLS AND KNOWLEDGE

- considerations involved in providing a genset exhaust system suitable for a given genset and installation site.
- major considerations and methods used in providing suitable noise attenuation for a genset installation.
- Specification of the physical accommodation requirements for a given genset to provide adequate air flow and noise attenuation, with due regard for safety, maintenance access, and in accordance with AS 3010 and AS 4509.
- methods used to allow extended service intervals for gensets
- main features of engine protection systems commonly used on small gensets and the genset sizes to which these are applicable.
- installation and commissioning work on a small genset and controller observing relevant OHS guidelines.
- symptoms of common genset faults
- basic fault location and rectification on a genset with the aid of troubleshooting guides or flowcharts.
- symptoms, causes and possible solutions for the phenomenon of "hunting".
- maintenance schedule for a hybrid power system.

Data communications encompassing:

- typical applications of data communications in renewable energy systems.
- different types of cables and connectors used in data communications between electronic devices and computers.
- commonly used protocols used for serial data communications
- different communications ports on palmtop, laptop or desktop computers
- Correction of an electronic device (e.g. inverter or charge controller) to a computer directly, and via modems and telephony network, using appropriate cabling, connectors and computer ports
- dial-up connection from a computer to a remote electronic device, such as an interactive inverter.
- standard terminal program or proprietary communications software to send to and receive data from an electronic device.
- Programming and retrieving data from an interactive inverter via a computer and data communications link.
- logged data downloaded from an interactive inverter.

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REQUIRED SKILLS AND KNOWLEDGE

Data-logging encompassing:

- general features and operation of on-site and remote data logging systems for monitoring and control of a hybrid energy system.
- logger programming, data downloading, display and interpretation of the results

Interactive inverters encompassing:

- main features of different devices commonly used as controllers in hybrid energy systems
- function and operation of an interactive inverter.
- system control philosophies used in different interactive inverters
- program parameters for an interactive inverter, as required for the correct operation of a parallel hybrid system given system component details, load data and preferred genset running times.
- appropriate charging regime for the system battery, based on manufacturer's data and system operating conditions.
- Programming an interactive inverter through its front panel interface.
- function, operation and major features of a genset controller and how it interfaces with a system controller such as an interactive inverter.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment,

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such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also

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comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design hybrid renewable power systems as described in 8) and including:

A	Developing outlines of alternative designs
B	Developing the design within the safety and functional requirements and budget limitations
C	Documenting and presenting design effectively
D	Successfully negotiating design alteration requests
E	Obtaining approval for final design
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing hybrid renewable power systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency

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development in this unit may be arranged concurrently with unit:

UEENEED10 1A Use computer applications relevant to a workplace

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different hybrid renewable power systems and their installation.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK134A Install ELV stand-alone photovoltaic power systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This competency standard unit covers the installation, adjustment and set up of ELV stand-alone photovoltaic power systems. It encompasses working safely and to installation standards, matching components with that specified for a given location, placing and securing system components accurately, making required circuit connections and completing the necessary installation documentation.

Application of the Unit

Application of the Unit

2)

This competency standard unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practice in the workplace provided equipment is not connected to installation wiring at voltages above 50 V a.c. or 120 V d.c. However other conditions may apply in some States and Territories

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License to practice **3)**

subject to regulations related to electrical work.

Note.

Competency requirements to be granted a license to carry out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and maths skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install ELV stand-alone photovoltaic power apparatus and systems.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been

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ELEMENT	PERFORMANCE CRITERIA	
		identified are noted and established risk control measures are implemented.
	1.4	Installation of the system is prepared in consultation with others affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or appropriate person to establish the scope of work to be undertaken.
	1.6	Sitting limitations and customer system requirements are identified by consultation with the customer.
	1.7	Energy demand is assessed and recommendations made to the customer for energy efficiency improvements if necessary.
	1.8	Suitable system components are specified and selected.
	1.9	Location of system components is planned within the constraints of the building structure and regulations.
	1.10	Advice is sought from appropriate persons to ensure the work is co-ordinated effectively with others.
	1.11	Materials and components needed for the installation work are obtained in accordance with established procedures, pre-assembled where necessary, and checked against job requirements.
	1.12	Materials and components are prepared for transport to the site and transport is arranged.
	1.13	Tools, equipment and testing devices needed for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.14	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.

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ELEMENT	PERFORMANCE CRITERIA	
2 Install ELV stand-alone photovoltaic power apparatus and systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Equipment is transported safely to the site.
	2.3	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.4	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.5	System components are installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance.
	2.6	Wiring is terminated at components and associated equipment in accordance with manufacture's specifications and functional and regulatory requirements.
	2.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.9	On-going checks of the quality of installed apparatus are undertaken in accordance with established procedures.
	2.10	System installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
3 Complete installation and report installation activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Final checks are made to that the installed apparatus conforms to requirements.
	3.4	System operation is tested and installation verified to be compliant with standards and work specifications.
	3.5	'As-installed' apparatus and associated equipment is documented and an appropriate person or persons notified in accordance with established procedures.
	3.6	Customer is informed of the system operation, routine maintenance and limitations.
	3.7	Appropriate documentation as required by standards or job specifications is provided to the customer.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and setting up ELV stand-alone photovoltaic power apparatus and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK134A Stand-alone ELV photovoltaic systems

Evidence shall show an understanding of the installation requirements for stand-alone ELV photovoltaic systems to the extent indicated by the following aspects:

T1 PV array installation requirements encompassing:

- OH&S requirements and methods for working on roofs.
- common methods of roof construction (rafters and tile battens) and methods to ensure integrity of waterproofing.
- common types of roof mounted and free-standing PV array

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REQUIRED SKILLS AND KNOWLEDGE

frame construction and methods of tilt angle adjustment.

- fixing methods for different roof types.
- array mounting methods for north orientation roof sections and non-north facing roof sections.
- aesthetic considerations in choosing an appropriate array location and type of mounting.
- the mounting and fixing methods for at least one type of domestic available building integrated PV product.

T2 Electrical PV array installation requirements encompassing:

- methods used in wiring and connecting PV arrays as per the Australian Standards AS 4509 and AS5033
- considerations involved in wiring of series connected PV modules in order to minimise power losses due to shading.
- PV array wiring diagram including the placement of blocking and bypass diodes.
- considerations involved in choosing the location of associated system equipment including regulators, d.c. control board,
- cable route from PV array/s to regulators so as to minimise the route length to battery so as to minimise the route length.

T3 System installation and maintenance encompassing:

- installation work on a PV power system in accordance with relevant standards and OH&S guidelines.
- correct isolation and shutdown procedures prior to carrying out maintenance tasks.
- routine maintenance tasks on PV arrays.
- required vegetation control to remove or reduce shading or soiling on a PV array

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

The evidence on which competency in this unit is based shall be considered holistically for each element on at least two occasions comprising:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Install and set up stand-alone (ELV) photovoltaic power systems as listed in Range statement' and including:

A Assessing customer energy requirements, efficiency improvements and site limitations.

B Reading and interpreting drawings related to and apparatus locations and circuit connections.

C Placing and securing system components accurately.

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D	Maintaining fire integrity
E	Connecting system components to comply with requirements.
F	Testing system operation and verifying compliance with standards and job specifications.
G	Completing necessary documentation including handing over system operational documents to the customer and informing customer of system operation, routine maintenance and limitations.
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in Context of and specific resources for assessment, evidence should show demonstrated competency in installing and setting up ELV stand-alone photovoltaic power systems.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units:

UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated by completing the installation of two different types of ELV stand-alone photovoltaic system on at least two occasions.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK135A Design grid connected photovoltaic power supply systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the design of grid connected photovoltaic power supply systems and their installation. It encompasses following design briefs, incorporating schemes for protection of persons and property from dangers of system malfunction, ensuring other safety and performance standards and functional requirements are meet and documenting design calculations and criteria

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 4 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design grid connected power supply systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	The extent and nature of the system is determined from design brief.
	1.3	Safety and other regulatory requirements to which the electrical installation must comply are identified, obtained and understood
	1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the installation or associated work.
2 Develop grid connected power supply systems design.	2.1	Knowledge of grid connected power supply system's performance standards, compliance methods is applied to the design.
	2.2	Alternative arrangements for the hybrid power systems design are considered based on the requirements outlined in the design brief.
	2.3	Safety, functional and budgetary considerations are incorporated in the design.
	2.4	Grid connected power supply system design draft is checked for compliance with the design brief and regulatory requirements.
	2.5	Grid connected power supply system design is documented for submission to appropriate persons for acceptance and approval.
	2.6	Solutions to unplanned situation are provided

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ELEMENT	PERFORMANCE CRITERIA	
		consistent with organisation policy.
3 Obtain approval for grid connected power supply systems design	3.1	Grid connected power supply system design is presented and explained to client representative and/or other relevant persons.
	3.2	Requests for alterations to the design are negotiated with relevant persons within the constraints of organisation policy.
	3.3	Final design is documented and approval obtained from appropriate persons.
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and designing grid connected photovoltaic power supply systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK135A Photovoltaic power systems -design

Evidence shall show an understanding of photovoltaic power systems design principles to an extent indicated by the following aspects:

Site Survey encompassing:

- declination angle, reflectance, sunshine hours, extraterrestrial irradiation
- energy efficiency techniques relevant for domestic dwelling and commercial premises to reduce the electrical energy demand.
- energy efficient initiatives that could be implemented by the site owner.
- assessing the occupational health and safety (OHS) risks

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REQUIRED SKILLS AND KNOWLEDGE

when working on that particular site.

- determining the solar access for the site.
- determining whether any shading will occur and estimate its effect on the system.
- estimation of the solar resource for the site.
- determining the available area for the solar array.
- determining whether the roof is suitable for mounting the array.
- determining how the modules will be mounted on the roof.
- determining where the switchboard or distribution board is located for connecting the output of inverter.
- determining where the array junction box (if required) and inverter will be located.
- determining the cabling route and therefore estimate the lengths of the cable runs.
- determining whether monitoring panels or screens are required and determine a suitable location with the site owner

PV arrays selection encompassing:

- selection and sizing of PV array for a grid-connected inverter system, based on any of: annual energy demand, budget constraints, architectural constraints or limitations on available inverter sizes.
- determining the minimum and maximum number of PV modules in a string for the specified voltage

System components selection encompassing:

- selection and sizing the balance of the system components including cabling, circuit protection and isolation equipment for a grid-connected PV system.
- determining the energy yield, specific energy yield and performance ratio for system
- schematic diagrams of common grid-connected inverter circuit configurations including metering arrangements, isolation and connection with respect to RCDs.
- the major installation details for a proposed grid-connected inverter system, based on the requirements set out in AS 4777 and AS5033

Other design considerations encompassing:

- major non-technical considerations impacting on the design, installation and operation of grid-connected PV systems

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REQUIRED SKILLS AND KNOWLEDGE

including economic, financial, contractual, institutional, legislative and regulatory.

- calculation of the annual reduction in greenhouse gas emissions achieved by a given PV power system at a given location.

Inverters encompassing:

- types of inverters used in grid connected systems.
- Australian standard symbol for a low voltage inverter
- the basic function of an inverter.
- simple block diagram of a typical inverter used in grid connected system

Inverter Operation encompassing:

- the basic principle of operation of a single phase inverter (using switch analogue)
- the operation of an inverter bridge and half-bridge configuration.
- operation of a FET inverter
- connection of a grid inverter and measurement of the inverter parameters for various loads

Inverter Characteristics encompassing:

- the characteristics which distinguish inverters suitable for grid connected photovoltaic array application from standard inverters.
- using waveform diagrams, the function of PWM techniques in square wave, modified square wave and synthesised sine wave inverters
- output voltage waveforms for square wave, modified square wave and synthesized sine wave inverters showing typical voltages and periodic times
- the six (6) essential inverter specifications

PV Grid Connected System Operation encompassing:

- block diagram of a PV grid connected system.
- operation of grid interactive PV systems including synchronisation, safety feature, power flow control, passive and active anti-islanding, and metered energy for systems.
- schematic diagrams of common grid connected inverter circuit configurations including metering arrangements, isolation and connection with respect to RCDs in accordance with AS 4777.1.

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REQUIRED SKILLS AND KNOWLEDGE

Grid connect inverter selection encompassing:

- determining the operating window of the inverter for the expected minimum and maximum effective cell temperatures
- selection of an inverter rating with respect to the output power of the array/s.
- major installation requirements for all system components which will ensure correct operation, long life, safety and ease of maintenance consistent with AS 4509, AS 4086.2, AS/NZS 3000 and relevant OH&S guidelines
- selection of a suitable location for the PV array, inverter and other components, at a given installation site in accordance with AS2676.2 and AS3011.2, and the considerations given in AS4509 and AS4086.2.
- typical installation configurations for grid connection of energy systems via inverters
- the function and operation of a "grid protection device" as specified in AS4777
- draft array wiring plan for series connected modules to minimise power loss due to shading at a particular site.
- installation requirements for a grid connected system.
- labelling and signage requirements for switchboards supplied with power from grid connected inverters, as set out in AS 4777.1.
- the additional requirements for UPS systems as specified in AS4777.1.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design grid connected photovoltaic power supply systems as described in 8) and including:

A Developing outlines of alternative designs

B Developing the design within the safety and functional requirements and budget limitations

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C	Documenting and presenting design effectively
D	Successfully negotiating design alteration requests
E	Obtaining approval for final design
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing grid connected photovoltaic power supply systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended

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primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 1A Use computer applications relevant to a workplace

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different grid connected photovoltaic power supply systems and their installation.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field

11)

Renewable and Sustainable Energy

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UEENEEK136A Install, configure and commission LV micro-hydro systems rated up to 6.4 kW

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and adjustment and set-up of LV micro-hydro systems rated up to 6.4 kW. It encompasses working safely and to installation standards, matching components with that specified for a given location, placing and securing system components accurately, making required circuit connections and completing the necessary installation documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development in entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace.

Note.

Competency requirements to be granted a license to carry out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies.

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License to practice **3)**

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG103A	Install low voltage wiring and accessories
UEENEEK124A	Solve basic problems in micro hydro systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install LV micro-hydro systems.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Health and safety risks are identified, and established risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented
	1.4	Installation of the system is prepared in consultation with others effected by the work and sequenced appropriately
	1.5	The nature and location of the work is determined from documentation or appropriate

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ELEMENT	PERFORMANCE CRITERIA	
		person to establish the scope of work to be undertaken
	1.6	Location of system components is planned within the constraints of the building structure, significants and regulations
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others
	1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements
	1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety
	1.10	Preparatory work is checked to ensure no damage has occurred and complies with requirements
2 Install LV micro-hydro systems.	2.1	OHS risk control measures and procedures are followed for carrying out the work
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	System components are installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance
	2.5	Wiring is terminated at system components in accordance with manufacturer specifications and functional and regulatory requirements
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person

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ELEMENT	PERFORMANCE CRITERIA	
		or persons and documented
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person
	2.8	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures
	2.9	Apparatus installation is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles
3 Completion and report installation activities.	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with established procedures
	3.3	Final checks are made so that the installed apparatus conforms to requirements
	3.4	‘As-installed’ apparatus and associated equipment is documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and installing and setting up LV micro-hydro systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK136A **Micro-hydro systems LV installation and maintenance processes**

Evidence shall show an understanding of micro-hydro systems LV installation and maintenance to an extent indicated by the following aspects:

Micro-hydro systems (MHS) LV installation processes encompassing:

- Selection of an appropriate MHS taking into account the topology of the site, local council approvals, environmental considerations, site access and transport of equipment, water and power transmission distances and daily and seasonal load profiles.
- Appropriate methods, using appropriate safety procedures, for: dam or weir construction; watercourse construction and/or penstock installation; turbine installation;
- Appropriate installation, testing, commissioning, fault diagnosis and rectification procedures using appropriate safety procedures.
- Schematic and wiring diagrams for the MHS showing the general circuit layout and protection between the MHS, batteries, inverter and loads according to Australian Standards AS/NZS3000, AS4509, and AS4086.2 requirements.
- Safety procedures for the installation, commissioning, fault diagnosis of system components.

Micro-hydro systems (MHS) maintenance processes encompassing:

- Appropriate maintenance methods using appropriate safety procedures.
- Maintenance schedule for the system.
- Safety procedures for the maintenance of system components.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and set up LV micro-hydro systems as described in 8) and including:

A	Reading and interpreting drawings related to and apparatus locations and circuit connections.
B	Placing and securing system components accurately

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C	Maintaining fire integrity
D	Connecting system components to comply with requirements
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and setting up LV micro-hydro systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended

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primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to installing LV micro-hydro systems in at least two different types of premises construction or environment.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field

11)

Renewable and Sustainable Energy

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UEENEEK137A Install, set up and maintain ELV micro-hydro systems rated up to 6.4 kW

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the installation and adjustment and set-up of ELV micro-hydro systems rated up to 6.4 kW. It encompasses working safely and to installation standards, matching components with that specified for a given location, placing and securing system components accurately, making required circuit connections and completing the necessary installation documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development in entry-level employment-based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Note.

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License to practice **3)**

Competency requirements to be granted a license to carry out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK124A	Solve basic problems in micro hydro systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and

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Numeracy'

Reading 3 Writing 3 Numeracy 3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install ELV micro-hydro systems.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Health and safety risks are identified, and established risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented
	1.4	Installation of the system is prepared in consultation with others effected by the work and sequenced appropriately
	1.5	The nature and location of the work is

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ELEMENT	PERFORMANCE CRITERIA	
		determined from documentation or appropriate person to establish the scope of work to be undertaken
	1.6	Location of system components is planned within the constraints of the building structure, significants and regulations
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others
	1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements
	1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and checked for correct operation and safety
	1.10	Preparatory work is checked to ensure no damage has occurred and complies with requirements
2 Install ELV micro-hydro systems.	2.1	OHS risk control measures and procedures are followed for carrying out the work
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	System components are installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance
	2.5	Wiring is terminated at system components in accordance with manufacturer specifications and functional and regulatory requirements
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person

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ELEMENT	PERFORMANCE CRITERIA	
		or persons and documented
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person
	2.8	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures
	2.9	Apparatus installation is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles
3 Completion and report installation activities.	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with established procedures
	3.3	Final checks are made so that the installed apparatus conforms to requirements
	3.4	‘As-installed’ apparatus and associated equipment is documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and installing and setting up ELV micro-hydro systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK137A **Micro-hydro systems ELV installation and maintenance processes**

Evidence shall show an understanding of micro-hydro system ELV installation and maintenance to an extent indicated by the following aspects:

Micro-hydro systems (MHS) ELV installation processes encompassing:

- Selection of an appropriate MHS taking into account the topology of the site, local council approvals, environmental considerations, site access and transport of equipment, water and power transmission distances and daily and seasonal load profiles.
- Appropriate methods, using appropriate safety procedures, for: dam or weir construction; watercourse construction and/or penstock installation; turbine installation;
- Appropriate installation, testing, commissioning, fault diagnosis and rectification procedures using appropriate safety procedures.
- Schematic and wiring diagrams for the MHS showing the general circuit layout and protection between the MHS, batteries, inverter and loads according to Australian Standards AS/NZS3000, AS4509, and AS4086.2 requirements.
- Safety procedures for the installation, commissioning, fault diagnosis of system components.

Micro-hydro systems (MHS) maintenance processes encompassing:

- Appropriate maintenance methods using appropriate safety procedures.
- Maintenance schedule for the system.
- Safety procedures for the maintenance of system components.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and set up ELV micro-hydro systems as described in 8) and including:

A	Reading and interpreting drawings related to and apparatus locations and circuit connections.
B	Placing and securing system components accurately

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C	Maintaining fire integrity
D	Connecting system components to comply with requirements
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and setting up ELV micro-hydro systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended

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primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to installing ELV micro-hydro systems in at least two different types of premises construction or environment.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field

11)

Renewable and Sustainable Energy

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UEENEEK138A Design micro-hydro systems rated to 6.4 kW

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design of micro-hydro systems rated to 6.4 kW and their installation. It encompasses following design briefs, incorporating schemes for protection of persons and property from dangers of system malfunction, ensuring other safety and performance standards and functional requirements are meet and documenting design calculations and criteria.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK124A	Solve basic problems in micro hydro systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design micro-hydro systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	The extent and nature of the electrical installation is determined from design brief
	1.3	Safety and other regulatory requirements to which the electrical installation must comply are identified, obtained and understood
	1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the installation or associated work
2 Develop micro-hydro systems design.	2.1	Knowledge of micro-hydro systems performance standards, compliance methods is applied to the design
	2.2	Alternative arrangements for the hybrid power systems design are considered based on the requirements outlined in the design brief
	2.3	Safety, functional and budgetary considerations are incorporated in the design
	2.4	Micro-hydro system design draft is checked for compliance with the design brief and regulatory requirements
	2.5	Micro-hydro system design is documented for submission to appropriate persons for acceptance and approval
	2.6	Solutions to unplanned situation are provided consistent with organisation policy
3 Obtain approval for micro-hydro systems design.	3.1	Micro-hydro system design is presented and explained to client representative and/or other relevant persons
	3.2	Requests for alterations to the design are negotiated with relevant persons within the constraints of organisation policy

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Final design is documented and approval obtained from appropriate persons
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and designing micro-hydro systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK138A Micro-hydro systems - design

Evidence shall show an understanding of micro-hydro design to an extent indicated by the following aspects:

T1 Site evaluation encompassing:

- definition of the terms: potential and kinetic energy, micro-hydro system, gross head, net head, flow rate.
- available head at a site using a dumpy level or theodolite, altimeter, pressure gauge and contour maps.
- the accuracy, advantages and disadvantages of each method for flow and head assessment.
- the flow rate of a given site using each of the following methods - catchment area calculations, water diversion to fill a container, stream velocity/area measurement and/or weir construction method.
- advantages and disadvantages of each method of head and flow measurement with particular reference to their accuracy.
- long term usable flow rate from long term stream flow if available able taking into account environmental considerations.
- effects of seasonal variation using long term weather data.
- typical daily and seasonal energy consumption profile at a given

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REQUIRED SKILLS AND KNOWLEDGE

site.

- effect of the energy demand profiles both daily and seasonally at the site on the system sizing.
- government regulatory requirements such as those covered under environmental or water resource legislation.
- environmental constraints at a site including minimum stream flow rates, ecological impacts, visual and noise impacts.

T2 System design encompassing:

- suitable MHS characteristics to suit site load, hydraulic head and stream flow rate characteristics and a suitable type of commercially available MHS to suit.
- frictional losses in delivery pipes using manufacturer's data.
- calculation of the energy output of the selected MHS at the site from water flow rate, head and manufacturer’s data, allowing for seasonal variations in performance and environmental constraints.
- design of any required weirs or dams, open races or penstocks, strainer and intake systems.
- optimum the position of the MHS and size of the MHS.
- suitable balance of system components including delivery pipe and fittings, transmission cable and voltage, voltage and frequency regulation, battery storage type and capacity, battery charger, inverter, back-up generator, and load dump.
- likely environmental impacts of the MHS and appropriate measures to minimise these impacts.

T3 System costing encompassing:

- major costs to be considered in the life cycle costing method.
- calculation of the capital and life cycle cost that includes the cost of various system configurations for a micro hydro application.
- external costs that might impact on the cost effectiveness of a MHS.
- most cost effective of a number of options on the basis of life cycle costing analysis

T4 Micro-hydro systems installation and maintenance processes encompassing

- Selection of an appropriate MHS taking into account the topology of the site, local council approvals, environmental considerations, site access and transport of equipment, water and power transmission distances and daily and seasonal load profiles.

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REQUIRED SKILLS AND KNOWLEDGE

- Appropriate methods, using appropriate safety procedures, for: dam or weir construction; watercourse construction and/or penstock installation; turbine installation;
- Appropriate installation, commissioning, fault diagnosis and rectification procedures and maintenance methods using appropriate safety procedures.
- Maintenance schedule for the system.
- Schematic and wiring diagrams for the MHS showing the general circuit layout and protection between the MHS, batteries, inverter and loads according to Australian Standards AS/NZS3000, AS4509, and AS4086.2 requirements.
- Safety procedures for the installation, commissioning, fault diagnosis and maintenance of system components.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

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various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge

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and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design micro-hydro systems as described in 8) and including:

A	Developing outlines of alternative designs
B	Developing the design within the safety and functional requirements and budget limitations
C	Documenting and presenting design effectively
D	Successfully negotiating design alteration requests
E	Obtaining approval for final design
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment,

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conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing micro-hydro systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 1A Use computer applications relevant to a workplace

Note:

Where dedicated application software is used in demonstrating competency this unit may be assessed concurrently with 'UEENEED101A Use computer applications relevant to a workplace

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different micro-hydro systems and their installation.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK139A Design stand-alone renewable energy (RE) systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the design of stand-alone renewable energy systems and their installation. It encompasses following design briefs, incorporating schemes for protection of persons and property from dangers of system malfunction, ensuring other safety and performance standards and functional requirements are meet and documenting design calculations and criteria.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK128A	Solve problems in stand-alone renewable energy systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design stand-alone renewable energy systems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	The extent and nature of the electrical installation is determined from design brief
	1.3	Safety and other regulatory requirements to which the electrical installation must comply are identified, obtained and understood
	1.4	Design development work is planned to meet scheduled timelines in consultation with others persons involved in the installation or associated work
2 Develop stand-alone renewable energy systems design.	2.1	Knowledge of stand-alone renewable energy systems performance standards, compliance methods is applied to the design
	2.2	Alternative arrangements for the hybrid power systems design are considered based on the requirements outlined in the design brief
	2.3	Safety, functional and budgetary considerations are incorporated in the design
	2.4	Stand-alone renewable energy system design draft is checked for compliance with the design brief and regulatory requirements
	2.5	Stand-alone renewable energy system design is documented for submission to appropriate persons for acceptance and approval
	2.6	Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for stand-alone renewable energy systems design.	3.1	Stand-alone renewable energy system design is presented and explained to client representative and/or other relevant persons
	3.2	Requests for alterations to the design are negotiated with relevant persons within the constraints of organisation policy

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Final design is documented and approval obtained from appropriate persons
	3.4	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and designing stand-alone renewable energy systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK139A **Stand-alone renewable energy system - design**

Evidence shall show an understanding of the design of stand-alone RE systems to an extent indicated by the following aspects:

T1 Load analysis and projected use

T2 Availability of sustainable /renewable energy sources

T3 Incorporating diesel generating plant

T4 Component selection factors encompassing:

- Intended environment
- Distance between system and users
- Maintenance and serviceability requirements
- Rating and diversity

T5 Installation requirement

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design stand-alone renewable energy systems as described in 8) and including:

A Developing outlines of alternative designs

B Developing the design within the safety and functional requirements and budget limitations

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C	Documenting and presenting design effectively
D	Successfully negotiating design alteration requests
E	Obtaining approval for final design
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing stand-alone renewable energy systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended

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primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEED10 Use computer applications relevant to a workplace 1A

Note:

Where dedicated application software is used in demonstrating competency this unit may be assessed concurrently with 'UEENEED101A Use computer applications relevant to a workplace

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to designing at least two different stand-alone renewable energy systems and their installation with at least three energy sources.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK140A Develop engineering solutions to renewable energy (RE) problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers developing engineering solutions to resolve problems with renewable energy. It encompasses working safely, applying extensive knowledge of renewable energy systems and components and their operating parameters, gathering and analysing data, and applying problem solving techniques, developing and documenting alternatives solutions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 6.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK131A	Design wind energy conversion systems (WECS) rated to 10 kW
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector
UEENEEK135A	Design grid connected photovoltaic power supply systems
UEENEEK138A	Design micro-hydro systems rated to 6.4 kW
UEENEEK139A	Design stand-alone renewable energy (RE) systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills	**5)**
	will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to develop engineering solution for renewable energy problems	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work
		1.3	The extent of the renewable energy problem is determined from performance specifications and situation reports and in consultation with relevant persons
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
		1.5	Effective strategies are determined to ensure solution development and implementation is carried out efficiently
2	Develop engineering solution for renewable energy problems	2.1	OHS risk control measures and procedures are followed for carrying out the work
		2.2	Knowledge of renewable energy systems and components, their construction, operation, characteristics and applications are applied to developing solutions to renewable energy problems

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ELEMENT		PERFORMANCE CRITERIA	
		2.3	Parameters, specifications and performance requirements in relation to each renewable energy problem are set in accordance with established procedures
		2.4	Approaches to resolving renewable energy problems are analysed to provide most effective solutions
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
		2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3	Test, document and implement engineering solution for renewable energy problem	3.1	Solutions to renewable energy problems are tested to determine their effectiveness and modified where necessary
		3.2	Adopted solutions are documented, including instructions for implementation that incorporates risk control measures to be followed
		3.3	Appropriately competent and qualified persons required to implement solutions to renewable energy problems are coordinated in accordance with regulatory requirements and enterprise policy (See Note)
		3.4	Justification for solutions used to solve renewable energy problems is documented for inclusion in work/project development records in accordance with professional standards

Note

A licence or permit to practise in the workplace is required for specified work on building and premises

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and developing engineering solutions to renewable energy problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK140A Renewable Energy Engineering

Evidence shall show an understanding of renewable energy engineering problem solving to an extent indicated by the following aspects:

T1 Energy and humanity encompassing:

- Need for energy and relationship between energy usage and standard of living
- Energy conversion - typical processes and efficiencies
- Sources of energy
- Solar energy - direct heating, photosynthesis, solar cells, power tower, hydrogen for solar energy, ocean thermal energy collector, solar ponds, wind and wave energy, hydro-electric power
- Geothermal energy
- Tidal energy
- Nuclear energy - fission and fusion, burner and breeder reactors
- Stored fuel reserves
- Fuel conservation - reduction in wastage, recycling, greater usage efficiency and use of waste heat
- Thermodynamics

T2 Basic Concepts encompassing:

- Nature of matter - atoms, molecules, inter-molecular forces, molecular motion, states of matter
- Mass and conservation of mass principle
- Volume, density, specific volume, relative density
- Force, weight, pressure (atmospheric, gauge and absolute)
- Temperature (Celsius and Kelvin)
- Systems and black box analysis
- Reciprocating piston and cylinder mechanism – pressure

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REQUIRED SKILLS AND KNOWLEDGE

ratio and compression ratio

T3 Energy encompassing:

- Definition and principles
- Potential energy
- Kinetic energy
- Work (linear and rotational), constant and variable force, relationship to pressure and volume change
- Power (linear and rotational)
- Sensible heat - specific heat capacity (constant pressure and constant volume)
- Latent heat
- Chemical energy - energy content of a fuel
- Internal energy

T4 Energy transfer in closed and open systems encompassing:

- Definition of a closed system
- Calorimetry as an example of a closed system (with or without phase change)
- Thermodynamics 1
- Non-flow energy equation - typical applications such as stirring with simultaneous heating or cooling
- Definition of an open system
- Mass and volume flow rate and continuity equation
- Steady flow energy equation (negligible change in kinetic or potential energy) leading to the concept of enthalpy - typical applications such as turbines, compressors, boilers and heat exchangers.

T5 Gases encompassing:

- Definition of a perfect or ideal gas in terms of the molecular model
- General gas equation
- Characteristic gas equation (equation of state)
- Constant pressure process
- Constant volume process
- Isothermal process
- Polytropic process
- Adiabatic process

T6 Heat engines encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Definition of a heat engine
- Essentials of a heat engine - heat source, heat sink, working substance, mechanical power output, working cycle
- Energy balance for a heat engine (as a black box) and efficiency
- Maximum possible efficiency (Carnot efficiency)
- Types of heat engines according to working substance, heat source, mechanical arrangement and working cycle
- Typical practical cycles - Stirling, Otto, Diesel, dual, two stroke (spark and compression ignition. Joule cycle.
- Thermodynamics 1

T7 Heat engine performance encompassing:

- Measurement of torque and power output - rope brake, shoe brake, hydraulic dynamometer, electric dynamometer
- Heat supply rate, efficiency, specific fuel consumption
- Measurement of indicated power - mechanical indicator, electric/electronic indicator, Morse test
- Friction power, mechanical efficiency, indicated thermal efficiency
- Volumetric efficiency
- Energy balance
- Performance curves - variable load constant speed, variable speed constant throttle setting.

T8 Structure of the existing generation, transmission and distribution system

T9 Benefits, issues and impacts

T10 Distributed generation technologies

T11 Electrical power distribution systems operation encompassing:

- Electrical characteristics of feeders
- Causes of voltage problems in a power distribution system
- Voltage regulation limits
- Calculations for feeder voltage drops
- Methods of voltage control
- Fault types, causes and effects
- Determination of fault levels
- Fault level limitation

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REQUIRED SKILLS AND KNOWLEDGE

T12 Protection and relaying encompassing:

- Protection system purpose and features
- Application of protection in a distribution network
- Protection system terminology
- Feeder protection systems

T13 Distributed generation issues encompassing:

- Utility requirements for interconnection
  Safety of personnel
  Islanding
  Grid Stability
- Voltage regulation
- Potential benefits of DG
- Limitations in design of distribution circuits (designed for 1-way operation)
- Match between supply and demand
- Operation: dispatchable and non-dispatchable supplies
- Factors affecting the sizing of distributed generation
- Use of energy storage
- Case studies

T14 Renewable energy supplies issues encompassing:

- Limits to penetration
- Factors affecting the value of renewables on the grid
- Implications of renewable input on power system operation
- Connection of energy systems via inverters: AS 4777

T15 Factors affecting the uptake of distributed generation encompassing:

- Institutional factors
- Regulatory factors
- Policy including mandated targets
- Green power market
- Financial issues
- Contractual issues
- Case studies

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop engineering solutions to renewable energy problems as described in 8) and including:

A	Understanding the extent of the renewable energy problem
B	Forming effective strategies for solution development and implementation

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C	Obtaining renewable energy system/component parameters, specifications and performance requirements appropriate to each problem.
D	Testing and solutions to renewable energy problems
E	Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.
F	Documenting justification of solutions implemented in accordance with professional standards
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved

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industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing engineering solutions to renewable energy problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to developing engineering solution for at least four renewable energy problems.

Note.

Typical renewable energy problems are those encountered in meeting performance requirements and compliance standards, revising a system operating parameters and dealing with system malfunctions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK142A Apply environmentally and sustainable procedures in the energy sector

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit requires the worker to undertake methods of work practice that minimises energy and material usage and to seek energy reduction strategies in the energy sector workplace. The unit seeks to minimise negative impacts on the environment.

Application of the Unit

Application of the Unit **2)**

This competency standards unit shall apply to persons entering work in energy sector and may be used in school based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work

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License to practice **3)**

platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and maths skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Plan and prepare to apply sustainable work practice	1.1	Activities are planned and prepared for to ensure OHS policies and procedures are followed with the work appropriately sequenced in accordance with requirements
	1.2	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved
	1.3	Materials are obtained and checked in accordance with established procedures and to comply with requirements
	1.4	Location in which activities are to be undertaken is determined from requirements
	1.5	Materials necessary to complete the work are obtained in accordance with established procedures and checked against job requirements
	1.6	Workplace environmental risks and resource efficiency issues are identified
2 Apply sustainable work practice	2.1	OHS policies and procedures for undertaking administrative functions are followed
	2.2	Activities are undertaken in accordance with requirements to implement techniques which produce energy reduction directly or indirectly
	2.3	Unplanned events or conditions are responded to in accordance with established procedures
	2.4	Approval is obtained in accordance with established procedures from appropriate personnel before any contingencies are

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ELEMENT	PERFORMANCE CRITERIA	
		implemented
	2.5	On-going checks of the quality of the work are undertaken in accordance with established procedures
	2.6	Work is carried out efficiently without unnecessary waste of materials or damage to the surrounding environment, while using sustainable work practices which minimise wastage of energy and materials either directly or indirectly
3 Complete the application of sustainable work practice	3.1	Documentation/reports are completed to ensure detailed promotional activities requirements are met
	3.2	Suggestions are made for improvements to workplace practices to minimise energy and materials wastage
	3.3	Completion is notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and applying environmentally and sustainable work practices in the energy sector.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK142A **Environmentally and sustainable work practice**

Evidence shall show an understanding of environmentally and sustainable work practices to an extent indicated by the following aspects:

T1 Sustainable work practices encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Notion of sustainable work practice
- Effects of neglecting sustainable work practice
- The greenhouse effect - causes, consequences.
- International and national greenhouse imperatives.
- The role of regulators and similar bodies
- Legislative requirements
- Economic benefits of sustainable initiatives.

T2 Techniques for reducing carbon produced energy and hence greenhouse gases encompassing:

- domestic, commercial and industrial strategies
- trade related technologies and methods
- energy efficient retrofits (overview).
- renewable energy technologies (overview)

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord

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with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

The evidence on which competency in this unit is based shall be considered holistically for each element on at least two occasions comprising:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable work practice principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Participate in environmentally sustainable work practices as listed in the Range statement' and including:

A Apply sustainable work practice in daily work activities

B Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

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Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in Context of and specific resources for assessment, evidence should show demonstrated competency in participating in environmentally sustainable work practices.

Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is

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primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to participating in environmentally sustainable work practices in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electronics
- Fire protection
- Instrumentation and control
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK143A Install small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers the installation, adjustment and set up of small wind energy conversion systems rated up to 10 kW for ELV stand-alone applications. It encompasses working safely and to installation standards, matching components with that specified for a given location, placing and securing system components accurately, making required circuit connections and completing the necessary installation documentation.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practice in the workplace provided equipment is not connected to installation wiring at voltages above 50 V a.c. or 120 V d.c. However other conditions may apply in some States and Territories

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License to practice **3)**

subject to regulations related to electrical work.

Note.

Competency requirements to be granted a license to carry out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEE1	Solve problems in d.c. circuits

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Prerequisite Unit(s) **4)**

04A

UEEENEEE 101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and maths skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install small ELV wind energy conversion systems.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Installation of the system is prepared in consultation with others affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or appropriate person to establish the scope of work to be undertaken.
	1.6	Sitting limitations and customer system requirements are identified by consultation with the customer.
	1.7	Suitable system components are specified and selected.
	1.8	Location of system components is planned within the constraints of the building structure and regulations.
	1.9	Advice is sought from appropriate persons to ensure the work is co-ordinated effectively with others.
	1.10	Materials and components needed for the installation work are obtained in accordance with established procedures, pre-assembled where necessary, and checked against job requirements.
	1.11	Materials and components are prepared for transport to the site and transport is arranged.
	1.12	Tools, equipment and testing devices needed for the installation work are obtained in accordance with established procedures and checked for

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ELEMENT	PERFORMANCE CRITERIA	
		correct operation and safety.
	1.13	Preparatory work is checked to ensure no unnecessary damage has occurred previously and complies with requirements.
2 Install small ELV wind energy conversion systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Equipment is transported safely to the site.
	2.3	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.4	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.5	System components are installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance.
	2.6	Wiring is terminated at components and associated equipment in accordance with manufacture’s specifications and functional and regulatory requirements.
	2.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.9	On-going checks of the quality of installed apparatus are undertaken in accordance with established procedures.
	2.10	System installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete installation and report installation activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final checks are made to that the installed apparatus conforms to requirements.
	3.4	System operation is tested and installation verified to be compliant with standards and work specifications.
	3.5	'As-installed' apparatus and associated equipment is documented and an appropriate person or persons notified in accordance with established procedures.
	3.6	Customer is informed of the system operation, routine maintenance and limitations.
	3.7	Appropriate documentation as required by standards or job specifications is provided to the customer.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing small wind energy conversion systems for stand-alone applications.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK143A Installation and maintenance of small ELV WECS

Evidence shall show an understanding of installation and maintenance of small ELV WECS to the extent indicated by the following aspects:

T1 Installation of a ELV WECS encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- selection of an appropriate tower for the installation of a WECS taking into consideration: soil type and footings, local council approvals, appropriate codes such as AS1170.2, transport of tower.
- appropriate methods, using appropriate safety procedures, for: raising tower and WECS, lightning protection, tower maintenance, safety in the erection and maintenance of the tower and WECS, site management to minimise environmental impacts.
- appropriate electrical transmission voltage and cable size from the WECS to the load or energy storage.
- appropriate installation, commissioning, fault diagnosis and rectification, using appropriate safety procedures. This will include: WECS power output, voltage regulation, and transmission cable voltage drop, manual and automatic furling, shut-down.
- schematic and wiring diagrams for the WECS showing the general circuit layout and protection between the WECS, energy storage, inverter and loads according to AS/NZS3000, AS4509 and lightning protection requirements.
- suitable layout for the location of energy storage to meet AS/NZS3000, AS3011.1 and AS4509.
- safety procedures for the installation, commissioning, fault diagnosis of system components.

Maintenance of a ELV WECS encompassing:

- appropriate methods, using appropriate safety procedures tower maintenance, safety.
- appropriate maintenance methods using appropriate safety procedures. This will include: WECS power output, voltage regulation, and transmission cable voltage drop, manual and automatic furling, shut-down.
- safety procedures for the maintenance of system components.
- maintenance schedule for the system.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

The evidence on which competency in this unit is based shall be considered holistically for each element on at least two occasions comprising:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Install and set up small WECS for ELV stand-alone applications as listed in the Range statement' and including:

A	Assessing customer energy requirements, efficiency improvements and site limitations.
B	Reading and interpreting drawings related to and apparatus locations and circuit connections.
C	Placing and securing system components

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	accurately.
D	Maintaining fire integrity.
E	Connecting system ELV components to comply with requirements.
F	Testing system operation and verifying compliance with standards and job specifications.
G	Completing necessary documentation including handing over system operational documents to the customer
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing small wind energy conversion systems for stand-alone applications.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated by completing the installation of small wind energy conversion systems for ELV stand-alone applications for one mainstream type of small WECS on at least two occasions.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK144A Install, configure and commission LV wind energy conversion systems rated up to 10 kW

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers the installation, configuration and commissioning of LV wind energy conversion systems rated up to 10 kW. It encompasses working safely and to installation standards, matching components with that specified for a given location, placing and securing system components accurately, making required circuit connections and completing the necessary installation documentation.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a licence to practice in the workplace.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of

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License to practice **3)**

training such as apprenticeships and the like.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

2. Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG103A	Install low voltage wiring and accessories
UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and maths skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install LV wind energy conversion systems.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented.
	1.4	Installation of the system is prepared in consultation with others affected by the work and sequenced appropriately.
	1.5	The nature and location of the work is determined from documentation or appropriate person to establish the scope of work to be undertaken.

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ELEMENT	PERFORMANCE CRITERIA	
	1.6	Sitting limitations and customer system requirements are identified by consultation with the customer.
	1.7	Suitable system components are specified and selected.
	1.8	Location of system components is planned within the constraints of the building structure and regulations.
	1.9	Advice is sought from appropriate persons to ensure the work is co-ordinated effectively with others.
	1.10	Materials and components needed for the installation work are obtained in accordance with established procedures, pre-assembled where necessary, and checked against job requirements.
	1.11	Materials and components are prepared for transport to the site and transport is arranged.
	1.12	Tools, equipment and testing devices needed for the installation work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.13	Preparatory work is checked to ensure no unnecessary damage has occurred previously and complies with requirements.
2 Install LV wind energy conversion systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Equipment is transported safely to the site.
	2.3	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.4	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.5	System components are installed to comply with

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ELEMENT		PERFORMANCE CRITERIA	
			technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance.
		2.6	Wiring is terminated at components and associated equipment in accordance with manufacture's specifications and functional and regulatory requirements.
		2.7	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
		2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.9	On-going checks of the quality of installed apparatus are undertaken in accordance with established procedures.
		2.10	System installation is carried out efficiently without unnecessary waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles.
3	Complete installation and report installation activities.	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Final checks are made to that the installed apparatus conforms to requirements.
		3.4	System operation is tested and installation verified to be compliant with standards and work specifications.
		3.5	'As-installed' apparatus and associated equipment is documented and an appropriate person or persons notified in accordance with established procedures.
		3.6	Customer is informed of the system operation, routine maintenance and limitations.

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ELEMENT	PERFORMANCE CRITERIA	
	3.7	Appropriate documentation as required by standards or job specifications is provided to the customer.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing LV wind energy conversion systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK144 A **Installation and maintenance of LV WECS**

Evidence shall show an understanding of installation and maintenance of small LV WECS to the extent indicated by the following aspects:

Installation of a LV WECS encompassing:

- selection of an appropriate tower for the installation of a WECS taking into consideration: soil type and footings, local council approvals, appropriate codes such as AS1170.2, transport of tower.
- appropriate methods, using appropriate safety procedures, for: raising tower and WECS, lightning protection, tower maintenance, safety in the erection and maintenance of the tower and WECS, site management to minimise environmental impacts.
- appropriate electrical transmission voltage and cable size from the WECS to the load or energy storage.
- appropriate installation, commissioning, fault diagnosis and rectification, using appropriate safety procedures. This will include: WECS power output, voltage regulation, and transmission cable voltage drop, manual and automatic furling, shut-down.
- schematic and wiring diagrams for the WECS showing the general circuit layout and protection between the WECS, energy storage, inverter and loads according to AS/NZS3000,

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REQUIRED SKILLS AND KNOWLEDGE

AS4509 and lightning protection requirements.

- suitable layout for the location of energy storage to meet AS/NZS 3000, AS 3011.1 and AS4509.
- safety procedures for the installation, commissioning, fault diagnosis of system components.

Maintenance of a LV WECS encompassing:

- appropriate methods, using appropriate safety procedures tower maintenance, safety.
- appropriate maintenance methods using appropriate safety procedures. This will include: WECS power output, voltage regulation, and transmission cable voltage drop, manual and automatic furling, shut-down.
- safety procedures for the maintenance of system components.
- maintenance schedule for the system.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord

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with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

The evidence on which competency in this unit is based shall be considered holistically for each element on at least two occasions comprising:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge

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and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. and

- Demonstrate an appropriate level of skills enabling employment; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and

- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Install and set up WECS for LV applications as listed in the Range statement' and including:

A	Assessing customer energy requirements, efficiency improvements and site limitations.
B	Reading and interpreting drawings related to and apparatus locations and circuit connections.
C	Placing and securing system components accurately.
D	Maintaining fire integrity.
E	Connecting system LV components to comply with requirements.
F	Testing and commissioning system operation and verifying compliance with standards and job specifications.
G	Completing necessary documentation including handing over system operational documents to the customer
H	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice

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using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing wind energy conversion systems for LV applications.

Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK130A	Solve problems in wind energy conversion systems rated up to 10 kW

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated by completing the installation of wind energy conversion systems for LV applications for one mainstream type of WECS on at least two occasions.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Renewable and Sustainable Energy

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UEENEEK145A Implement and monitor energy sector environmental and sustainable policies and procedures

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This Competency Standard Unit specifies the outcomes for the collecting, interpretation and application of environmental management information, the identification of environmental impacts and the assessment of risks. It also consists of monitoring while implementing environmentally sustainable work polices and plans an, the development of modifications as part of the review process.

Application of the Unit

Application of the Unit **2)**

This Competency Standard Unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training. The unit addresses information processes and techniques for the implementation and monitoring of work place procedures that minimise energy use in the workplace.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a licence/registration to practice in the work place subject to regulations for undertaking of electrical work.

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License to practice **3)**

Practice in workplace and during training is also subject to regulations directly related to Occupational Health and Safety, electricity/telecommunications/gas/water industry safety and compliance, industrial relations, environmental protection, anti discrimination and training. Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no pre-requisites for this unit

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and maths skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare/plan to implement and monitor environmentally sustainable work practice management policies and procedures	1.1	Works schedule(s), including drawings, plans, requirements, established procedures, and material lists, are obtained, analysed, if necessary, by site inspection and the extent of the preparation of the work determined for planning and coordination.
	1.2	Work is prioritised and sequenced for the most efficient and effective outcome following consultation with others for completion within acceptable timeframes, to a quality standard and in accordance with established procedures.
	1.3	Relevant requirements (including environmental regulations) and established procedures for the work are given to all personnel and identified for all work sites.
	1.4	Hazards are identified, OHS risks assessed and control measures are prioritised, implemented and monitored to ensure safe systems of work are followed and according to established procedures.
	1.5	Resources including personnel, equipment, tools and personal protective equipment required for the job are identified, scheduled and coordinated and confirmed in a safe and technical working order.
	1.7	Risk management is applied to the job identifying and itemising ways in which energy wastage can be minimised
	1.8	Items for installation are sourced, where

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ELEMENT		PERFORMANCE CRITERIA	
			possible, that are recycled or reusable, in consultation with an agreement of the customer.
2	Carry out the implementation and monitoring of environmentally sustainable work management policies and procedures	2.1	Environmentally sustainable work practice to reduce/ minimise waste and excessive energy use are implemented and monitored in accordance with requirements and/or established procedures with input being sought from specialists where possible
		2.2	Implementation and monitoring of environmentally sustainable energy management policies and procedures are carried out, in accordance with the work schedule and requirements and/or established procedures.
		2.3	Essential Knowledge and Associated Skills in the safe implementation and monitoring of environmental and sustainable energy management policies and procedures are applied to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements.
		2.4	Solutions to non-routine problems are identified and actioned using acquired Essential Knowledge and Associated Skills according to requirements.
		2.5	Ongoing checks of quality of the work are undertaken in accordance with requirements and established procedures to ensure a quality like outcome is achieved for the client/customer and to a community/industry standard.
3	Complete the implementation and monitoring of environmental and sustainable energy management policies and procedures	3.1	Work undertaken is checked against works schedule for conformance with requirements, anomalies reported and solutions identified in accordance with established procedures.
		3.2	Work site is rehabilitated, cleaned up and confirmed safe in accordance with established procedures.
		3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance

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ELEMENT	PERFORMANCE CRITERIA	
		with established procedures.
	3.4	Materials suitable for recycling and or reuse are identified and are stored for further use or proper disposal.
	3.5	Policies for implementing and monitoring of sustainable work practices are reviewed and updated from the experience of the current job and new procedures implemented if required.
	3.6	Relevant work permit(s) are signed off and the work completed/returned to service and advised to client/customer in accordance with requirements.
	3.7	New targets for energy minimisation are set, in keeping with successful strategies
	3.8	Successful strategies are promoted and where possible participants rewarded

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired implementing & monitoring, policies & procedures for environmentally sustainable electrotech work practice.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK145A **Environmental and sustainable work practice - supervisory responsibilities**

Evidence shall show an understanding of environmentally sustainable work practice, supervisory responsibilities to an extent indicated by the following aspects:

T1 Environmentally sustainable work practice principles encompassing:

- Provisions of relevant environmental legislation

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REQUIRED SKILLS AND KNOWLEDGE

- Notion of sustainable work practice
- Effects of neglecting sustainable work practice
- The greenhouse effect - causes, consequences.
- International and national greenhouse imperatives.
- The role of regulators and similar bodies
- Economic benefits of sustainable initiatives.
- Techniques for reducing the use of carbon based energy sources and hence greenhouse gas emissions
- domestic, commercial and industrial strategies
- trade related technologies and methods
- renewable energy technologies
- energy efficient retrofits

T2 Implementing and monitoring encompassing:

- Principles and practice of effective sustainable work practice management
- Workplace sustainable work practice non compliance, range and selection of control measures
- Organisational systems and policies and procedures needed for legislative compliance
- Impact of characteristics and composition of the workforce on sustainable work practice management
- Relevance of sustainable work practice management to other organisational management policies, procedures and systems.
- Analysis of entire work environment and judge sustainable work practice interventions
- Analysis of relevant workplace data
- Ability to assess resources needed for risk control.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

The evidence on which competency in this unit is based shall be considered holistically for each element on at least two occasions comprising:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
  - Implement and monitor, policies and procedures for environmentally and sustainable electrotech work practice as listed in the Range statement' and including

A Providing environmentally sustainable work practice information to the work group

B Implementing and monitoring participative arrangements for the management of environmentally sustainable work practice

C Implementing and monitoring the procedures for identifying procedures for identifying hazards,

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	assessing risks and controlling risks
D	Implementing the procedures for dealing with hazardous events
E	Implementing and monitoring the procedures for environmentally sustainable work practice
F	Implementing and monitoring the procedures for maintaining environmentally sustainable work practice records
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual implementation and monitoring of environmental and sustainable energy management policies and procedures.

The resources used for assessment should reflect current industry practices in relation to implementing and monitoring, policies and procedures for environmentally and sustainable electrotech work practice.

Method of assessment

9.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this Competency Standard Unit applies. This requires that the specified Essential Knowledge and

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Associated Skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units:

UEENEEE117A	Implement and monitor energy sector OHS policies and procedures

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall/may be demonstrated in relation to implementing and monitoring, policies and procedures for environmentally and sustainable electrotech work practice and may include the following equipment:

The following constants and variables included in the elements and performance criteria in this unit augment other definitions described in the Definitions section of this Training Package and form an integral part of the Range Statement of this unit:

- Environmental legislation may include relevant federal legislation; relevant state/territory legislation; relevant local government by-laws; relevant government or quasi government policies and regulations; relevant community planning and development agreements (e.g. Land care agreements)
- Environmental management documentation may include information on applicable environmental laws or other requirements; complaint records; training records; process information; process operational log books; inspection, maintenance and calibration records; relevant contractor and supplier information; incident reports; information on emergency preparedness and response.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK146A Design energy management controls for electrical installations in buildings

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This competency standard unit covers designing and developing methods to reduce the energy use without compromising occupancy standards in new buildings and structures. The unit encompasses working safely, setting up and conducting evaluation measurements, predicting energy use from plans and specifications and designing and documenting strategies to effectively reduce energy use in the completed installation. It draws on some multi-disciplinary skills.

Application of the Unit

Application of the Unit

2)

This competency standards unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training. It is intended to apply to any formal recognition for this standard at the aligned AQF 6.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a licence to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of

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License to practice **3)**

training such as new apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and maths skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to design energy management techniques for electrical installations in buildings	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the electrical design is determined from specifications of building and its services, plant and machinery and discussion with appropriate personnel.
	1.4	Advice is sought from allied trade's areas (e.g. air conditioning) on required energy usage and system design.
	1.5	Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.6	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2 Design energy management techniques for electrical installations in buildings	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Tests and measurements are carried out in strict accordance with OHS requirements safety procedures.
	2.3	In-depth knowledge of the energy use of building services, plant and machinery is applied to the design process

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ELEMENT		PERFORMANCE CRITERIA	
		2.4	Energy evaluation tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
		2.5	Strategies to reduce energy use without compromising occupancy standards are developed from knowledge of energy management and evaluation test results.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.7	Design and evaluation is carried out without unnecessary damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.
3	Design energy management techniques for electrical installations in buildings	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Work site is cleaned and made safe in accordance with established procedures.
		3.3	Results of design and recommended strategies and their criterion for energy reduction are documented in accordance with established procedures.
		3.4	Plans, wiring diagrams and specifications are forwarded to appropriate persons.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing energy management controls for electrical installations in buildings.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK146A **Building management control systems**

Evidence shall show an understanding of building management systems to an extent indicated by the following aspects:

T1 Functions of a BMS encompassing:

- autonomous functions
- input
- output
- general I/O
- installation management items
- energy management
- risk management
- information processing
- objectives
- building running costs
- smoke control as per AS 1668 part 1

T2 BMS hardware encompassing:

- system architecture
- communication devices
- substations
- personal computers
- interfaces with other systems

T3 Input and output functions encompassing:

- digital inputs/outputs
- digital output with status feedback
- analogue input/output
- sensors
- alarms

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REQUIRED SKILLS AND KNOWLEDGE

T4 Energy management encompassing:

- night cycle
- optimum stop/start
- time and event programs
- night purge
- outside air percentage control
- enthalpy control
- power demand control
- duty cycle
- presence detection
- lighting control

T5 Information processing functions encompassing:

- computer systems
- central system management
- programs
- system configuration and security
- operator - machine interface
- data points

Risk and maintenance management encompassing:

- system files
- fire, intruder control
- access control

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

The evidence on which competency in this unit is based shall be considered holistically for each element on at least two occasions comprising:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements; and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Design energy management controls for electrical installations in buildings as listed in the Range statement' and including:

A	Determining the extent of the design
B	Setting up and conducting appropriate examinations and tests.
C	Reporting evaluation including recommendation for improving energy efficiency

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D	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing energy management controls for electrical installations in buildings.

Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this

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unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to designing energy management controls for electrical installations in buildings on at least two buildings each used for a different purpose.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field

11)

Renewable and Sustainable Energy

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UEENEEK148A Install, configure and commission LV grid connected photovoltaic power systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the installation, adjustment and set-up of photovoltaic power systems and connecting to a supply grid inverter. It encompasses working safely and to installation standards, matching components with that specified for a given location, placing and securing system components accurately, making required circuit connections and completing the necessary installation documentation.

Application of the Unit

Application of the Unit

2)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the

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recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable, contracts of training such as apprenticeships.

Note.

Competency requirements to be granted a license to carry out installations, fault finding, repair or maintenance on low voltage electrical installations is incorporated in unit UEENEEG105A and all prerequisite units it specifies

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems
UEENEEG103A	Install low voltage wiring and accessories

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install photovoltaic power systems.	1.1	OHS procedures for a given work area are obtained and understood
	1.2	Health and safety risks are identified and established risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards that have not previously been identified are noted and established risk control measures are implemented
	1.4	Installation of the system is prepared in consultation with others effected by the work and sequenced appropriately
	1.5	The nature and location of the work is determined from documentation or appropriate person to establish the scope of work to be undertaken
	1.6	Location of system components is planned within the constraints of the building structure, significants and regulations
	1.7	Advice is sought from appropriate persons to ensure the work is coordinated effectively with others
	1.8	Material needed for the installation work is obtained in accordance with established procedures and checked against job requirements
	1.9	Tools, equipment and testing devices needed to for the installation work are obtained in accordance with established procedures and

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ELEMENT	PERFORMANCE CRITERIA	
		checked for correct operation and safety
	1.10	Preparatory work is checked to ensure no damage has occurred and complies with requirements
2 Install photovoltaic power systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed (Note 1: risk control measures need to incorporate risks associated with dc voltages of extra low voltage and low voltage levels)
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	System components are installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance (Note 2: hazards relating to photovoltaic energy apparatus and isolation need to specifically address issues of dc arcing and suitable dc protection systems for dc voltages of extra low voltage and low voltage levels.)
	2.5	Wiring is terminated at components and associated equipment in accordance with manufacturer specifications and functional and regulatory requirements
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person
	2.8	Ongoing checks of the quality of installed apparatus are undertaken in accordance with established procedures

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ELEMENT	PERFORMANCE CRITERIA	
	2.9	System installation is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles
3 Completion and report installation activities.	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work site is cleaned and made safe in accordance with established procedures
	3.3	Final checks are made so that the installed apparatus conforms to requirements
	3.4	'As-installed' apparatus and associated equipment is documented and appropriate person(s) notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and installing and setting up LV grid connected photovoltaic power systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK148A **Photovoltaic LV installations**

Evidence shall show an understanding of LV photovoltaic array grid connection to the extent indicated by the following aspects:

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REQUIRED SKILLS AND KNOWLEDGE

T1 PV array installation requirements encompassing:

- OH&S requirements and methods for working on roofs.
- common methods of roof construction (rafters and tile battens) and methods to ensure integrity of waterproofing.
- common types of roof mounted and free-standing PV array frame construction and methods of tilt angle adjustment.
- fixing methods for different roof types.
- array mounting methods for north orientation roof sections and non-north facing roof sections.
- aesthetic considerations in choosing an appropriate array location and type of mounting.
- the mounting and fixing methods for at least one type of commercially available building integrated PV product.

T2 Electrical PV array installation requirements encompassing:

- methods used in wiring and connecting PV arrays as per the Australian Standards AS 4509 and AS5033
- considerations involved in wiring of series connected PV modules in order to minimise power losses due to shading.
- PV array wiring diagram including the placement of blocking and bypass diodes.
- considerations involved in choosing the location of associated system equipment including regulators, d.c. control board, inverters and inverters for grid connected systems.
- cable route from PV array/s to inverters so as to minimise the route length.

T3 System installation and maintenance encompassing:

- installation work on a PV power system in accordance with relevant standards and OH&S guidelines.
- correct isolation and shutdown procedures prior to carrying out maintenance tasks.
- routine maintenance tasks on PV arrays.
- required vegetation control to remove or reduce shading or soiling on a PV array

T4 Inverters encompassing:

- types of inverters used in grid connected systems.
- AS symbol for a low voltage inverter
- the basic function of an inverter.
- simple block diagram of a typical inverter used in grid

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REQUIRED SKILLS AND KNOWLEDGE

connected system

T5 Inverter operation encompassing:

- the basic principle of operation of a single phase inverter (using switch analogue)
- the operation of an inverter bridge and half-bridge configuration.
- operation of a FET inverter
- connection of a grid inverter and measurement of the inverter parameters for various loads

T6 Inverter characteristics encompassing:

- the characteristics which distinguish inverters suitable for grid connected photovoltaic array application from standard inverters.
- using waveform diagrams, the function of PWM techniques in square wave, modified square wave and synthesised sine wave inverters
- output voltage waveforms for square wave, modified square wave and synthesized sine wave inverters showing typical voltages and periodic times
- the six (6) essential inverter specifications

T7 PV grid connected system operation encompassing:

- block diagram of a PV grid connected system.
- operation of grid interactive PV systems including synchronisation, safety feature, power flow control, passive and active anti-islanding, and metered energy for systems.
- schematic diagrams of common grid connected inverter circuit configurations including metering arrangements, isolation and connection with respect to RCDs in accordance with AS 4777.1.

T8 Installation of grid connected inverters encompassing:

- major installation requirements for all system components which will ensure correct operation, long life, safety and ease of maintenance consistent with AS 4509, AS 4086.2, AS/NZS 3000 and relevant OH&S guidelines

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REQUIRED SKILLS AND KNOWLEDGE

- selection of a suitable location for the PV array, inverter and other components, at a given installation site in accordance with AS2676.2 and AS3011.2, and the considerations given in AS4509 and AS4086.2.
- typical installation configurations for grid connection of energy systems via inverters
- the function and operation of a "grid protection device" as specified in AS4777
- array wiring plan for series connected modules to minimise power loss due to shading at a particular site.
- installation requirements for a grid connected system.
- labelling and signage requirements for switchboards supplied with power from grid connected inverters, as set out in AS 4777.1.
- the additional requirements for UPS systems as specified in AS4777.1.
- installation of a PV grid connected system

T9 System commissioning and maintenance encompassing:

- the isolation procedures required for grid connected inverters.
- relevant commissioning procedures including start-up and shut-down procedures for grid connected inverter systems in accordance with AS 4509.
- testing a grid connected inverter system for correct operation.
- location and rectification of an electrical fault within a PV array/inverter and wiring.
- maintenance schedule for a grid connected PV power system.
- performing commissioning work on a PV power system in accordance with AS 4509, AS 4086.2, AS/NZS 3000 and AS 3010.1

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and set up grid connected photovoltaic power systems as described in 8) and including:

A	Reading and interpreting drawings related to and apparatus locations and circuit connections
B	Placing and securing system components accurately

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C	Maintaining fire integrity
D	Connecting system components to comply with requirements
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and setting up LV grid connected photovoltaic power systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended

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primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEK125A	Solve basic problems in photovoltaic energy apparatus and systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to installing photovoltaic power systems in at least two different types of premises construction or environment.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK149A Verify compliance and functionality of a extra low voltage renewable energy installation

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This competency standard unit covers inspection and testing to verify whether a extra low voltage Stand-alone Power System is safe and complies with all requirements. It encompasses working safely, visual inspections and mandatory, optional and functional test procedures, identifying non-compliance defects and mandatory reporting requirements.

Application of the Unit

Application of the Unit **2)**

This competency standard unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do NOT require a licence to practice in the workplace at ELV levels, subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of

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License to practice **3)**

training such as apprenticeships and the like.

Note:

Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation and the like.

Compliance may be required in various jurisdictions relating to currency in first aid, confined space, lifting, risk safety measure and the like.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE108A	Lay wiring/cabling and terminate accessories for extra-low voltage (ELV)

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Prerequisite Unit(s) **4)**

	circuit
UEENEEE119A	Solve problems in multiple path extra low voltage (ELV) a.c. circuits
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEK123A	Carry out basic repairs to renewable energy apparatus
UEENEEK127A	Diagnose and rectify faults in renewable energy control systems
UEENEEK128A	Solve problems in stand-alone renewable energy systems
UEENEEK134A	Install ELV stand-alone photovoltaic power systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and maths skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to inspect and test an RE installation.	1.1	OHS procedures for a given work area are obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	Documentation or deemed to comply standard on which installation is based is reviewed and understood.
	1.5	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
	1.7	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
2 Visually inspect and conduct safety testing on the installation.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and

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ELEMENT	PERFORMANCE CRITERIA	
		when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Wiring is checked for suitability for the environments in which they are installed and suitably protected from damage or overheating.
	2.5	Cable conductor sizes are acquired as meeting current-carrying capacity requirements and voltage\- drop
	2.6	Protection methods and devices are validated as meeting co-ordination requirements for overload and short-circuit protection.
	2.7	Switchgear and control gear is validated as being appropriately rated and meeting functional requirements.
	2.8	Evidence that electrical equipment complies with safety requirements is cited.
	2.9	Earthing system components are checked that they are correctly located and conductors correctly sized.
	2.10	Marking on switchboards are checked for accuracy and clarity and comply with requirements.
	2.11	Visual inspection is conducted to ensure that the system complies with requirements.
	2.12	Testing is conducted to verify that circuit connections are correct; voltage drop is within limits; circuit protection operates as intended; polarities are correct; charging rates are compliant with specification
3 Report inspection and test findings.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in

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ELEMENT	PERFORMANCE CRITERIA	
		accordance with established procedures.
	3.3	Non-compliance defects are identified and reported in accordance with established procedures
	3.4	Recommendations for rectifying defects are made in accordance with established procedures.
	3.5	Documentation is completed in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of verifying compliance and functionality of renewable energy installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK149A **RE installations, ELV installation requirements**

Evidence shall show an understanding of ELV renewable energy installation requirements to an extent indicated by the following aspects:

T1 RE installations, ELV installation requirements encompassing:

- Requirements for installation of wiring and equipment
- Compliant methods for providing protection
- Requirements for installation planning and selection of equipment
- Testing and verification requirements
- Documentation encompassing:
  - results of tests conducted that comply with requirements and ensure the RE - ELV installation is safe, including any formal documents of the results of testing required by authorities.
  - documents of periodic inspection and testing of RE - ELV

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REQUIRED SKILLS AND KNOWLEDGE

wiring and equipment including any tagging, in accordance with requirements.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for all training agreements. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered

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will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

The evidence on which competency in this unit is based shall be considered holistically for each element on at least two occasions comprising:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. and
  - Demonstrate an appropriate level of skills enabling employment; and
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Verify compliance and functionality of renewable energy installations as described as described in 8) and including:

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A	Selecting correct tools and testing equipment.
B	Identifying visual non-compliance defects.
C	Using effective methods for conducting tests.
D	Identifying non-compliance from test results.
E	Identifying causes of non-compliance.
F	Completing mandatory reporting.
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit.

Resources required to assess this unit are listed above in Context of assessment', which should also be used in the formal learning/assessment environment.

Note:
Where simulation is considered a suitable strategy for assessment it must ensure that the conditions for assessment are authentic and as far as possible reproduce and replicate the workplace and is consistent with the approved industry simulation policy.

In addition to the resources listed above in Context of and specific resources for assessment, evidence should show demonstrated competency in verifying compliance and functionality of general electrical installations.

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Method of assessment

9.4)

This competency standard unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this competency standard unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency standard unit shall be demonstrated in relation to verifying compliance and functionality of at least two electrical installations comprising a PV Array of at least 450 W, a battery bank, an inverter, a battery charger (or Inverter/Charger) and a generating set with reference to AS 4509, AS 4086 and AS/NZS 5033, AS 3010 including relevant sections of AS/NZS 3000.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK151A Develop effective engineering strategies for energy reduction in buildings

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers evaluating energy used in buildings and developing and documenting strategies/methods to effectively reduce energy use without compromising occupancy standards. It encompasses working safely, setting up and conducting evaluation measurements and evaluating energy use from measured parameters.

Application of the Unit

Application of the Unit

2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It applies to any formal recognition for this standard at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed:

UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop strategies for effective energy reduction in buildings.	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	The extent of evaluation is determined from specifications of building(s) and services, plant and machinery and discussed with appropriate personnel
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others
	1.5	Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety
2 Develop strategies for effective energy reduction in buildings.	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Tests and measurements are carried out in strict accordance with OHS requirements safety procedures
	2.3	In-depth knowledge of the energy use of building services, plant and machinery is applied to the evaluation process
	2.4	Energy evaluation tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny

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ELEMENT		PERFORMANCE CRITERIA	
		2.5	Strategies to reduce energy use with compromising occupancy standards are developed from knowledge of energy management and evaluation test results.
		2.6	Unexpected situations are dealt with safely and with the approval of an authorised person
		2.7	Evaluation is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices
3	Document and report strategies for effective energy reduction in buildings	3.1	OHS work completion risk control measures and procedures are followed
		3.2	Work site is cleaned and made safe in accordance with established procedures
		3.3	Results of energy use evaluation and recommended strategies and their criterion for energy reduction are documented in accordance with established procedures
		3.4	Energy reduction report is forwarded to appropriate persons

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and developing strategies for effective energy reduction in buildings.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK151A **Energy efficient building design**

Evidence shall show an understanding of energy efficient building

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REQUIRED SKILLS AND KNOWLEDGE

design to an extent indicated by the following aspects:

T1 Climate and thermal comfort encompassing:

- characteristics of the different Australian climatic types.
- use of climatic data in published and electronic forms to extract the quantities relevant to energy efficient design.
- relationship between climate and comfort using bioclimatic or psychrometric charts.
- calculation of heating or cooling degree days or degree hours for various locations.
- calculation of thermal neutrality for a given location.

T2 Solar geometry and radiation encompassing:

- definition of the terms: declination, hour angle, zenith angle, azimuth and altitude angles, the equation of time.
- conversion of solar time to local time and vice versa.
- position of the sun and the length of shadows with the aid of algorithms, tables, sun charts or computer software.
- daily irradiation incident on a wall, window or roof of a given tilt and orientation.
- relative summer and winter irradiation of windows facing the cardinal orientations.

T3 Heat transfer encompassing:

- thermal processes of conduction, convection and radiation apply to the transfer of heat in buildings.
- calculation of the summer and winter U-values of building elements using tables and software.
- calculation of the infiltration heat transfer in a building.

T4 Glazing Systems encompassing:

- different types of glazing systems and their characteristics.
- different types of shading devices and the window orientations for which they are most appropriate.
- solar heat gain for different glazing types and angles of incidence
- calculation of the average daily irradiation of a window partly shaded by eaves, using computer software.
- calculation of the average daily heat gain through a window partly shaded by eaves.

T5 Insulation encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- different types of insulation and where they are used.
- how different types of insulation are installed in roofs, walls and floors.
- determination of the minimum R-values of roof insulation for different locations using Australian Standard AS2627 or similar standards.

T6 Thermal mass encompassing:

- advantages and disadvantages of using substantial thermal mass in different climate types and for different heating and cooling regimes.
- where thermal mass can be located in a building.
- explain what is meant by the following terms: time lag, decrement factor, admittance, response factor.

T7 Comfort control strategies encompassing:

- interpretation of the usefulness of a design strategy with the aid of a psychrometric chart showing control potential zones for a particular location.
- selection of the most useful comfort control strategies for Australian climatic regions.

T8 Energy efficiency in buildings encompassing:

- determination of the direction of the following: both true and magnetic, north winter and summer sunrise, winter and summer sunset.
- solar access in summer and winter to various possible house locations on a site and room locations within the house.
- how vegetation can be used to both funnel and deflect wind.
- using cross ventilation as a cooling strategy.

T9 Thermal performance of a building encompassing:

- heating requirements of a building using the heating degree day or hour method.
- dynamic performance predicted by a computer simulation program such as NatHERS or BERS.

T10 Integration of active solar systems encompassing:

- active solar system types available which can provide hot water, space heating and cooling.
- the best location on the roof, and the optimum tilt and orientation of the collector panels.
- function of the main components of an air or water-based

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REQUIRED SKILLS AND KNOWLEDGE

solar space heating system.

- schematic of the fluid circuit of an air or water- based space heating system.
- main solar cooling system types.

T11 Energy rating schemes encompassing:

- differences in approach used by house energy rating schemes in Australia.
- energy performance of a number of houses using a computer simulation program such as NatHERS or BERS.
- other methods to reduce energy consumption within and outside a building including appliance efficiency, human behaviour changes, building management strategies and transportation minimisation.
- additional cost of energy efficiency measures and cost savings using life cycle cost or simple pay back methods according to Aust. Standard AS3595 and AS4536.

T12 Sustainable and safe building materials encompassing:

- common building materials and their embodied energy content.
- environmental impact of the production of various building materials.
- problems associated with the use or disposal of building materials.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop strategies for effective energy reduction in buildings as described in 8) and including:

A Determining the extent of the evaluation.

B Setting up and conducting appropriate examinations and tests.

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C	Reporting evaluation including recommendation for improving energy efficiency
D	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing strategies for effective energy reduction in buildings.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate

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the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to developing strategies for effective energy reduction in at least two buildings each used for a different purpose.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK152A Develop strategies to address sustainability issues for electrical installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers developing strategies to address greenhouse gases and sustainability issues for residential, commercial and industrial electrical installations. It encompasses working safely, apply extensive knowledge of electrical installations and components and their operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting alternatives solutions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop strategies to address sustainability issues.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	The extent of the sustainability issues are determined from performance specifications and situation reports and in consultation with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
	1.5	Effective strategies are determined to ensure solution development and implementation is carried out efficiently

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ELEMENT	PERFORMANCE CRITERIA	
2 Develop strategies to address sustainability issues	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Knowledge of sustainability is applied to developing strategies to address greenhouse gas and sustainability issues
	2.3	Parameters, specifications and performance requirements in relation to sustainability issues are set in accordance with established procedures
	2.4	Approaches to resolving sustainability issues are analysed to provide most effective solutions
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3 Document strategies to address sustainability issues.	3.1	Solutions to sustainability issues are tested to determine their effectiveness and modified where necessary
	3.2	Adopted solutions are documented, including instructions for implementation that incorporates risk control measures to be followed
	3.3	Appropriately competent and qualified persons required to implement solutions to sustainability issues are coordinated in accordance with regulatory requirements and enterprise policy (See Note)
	3.4	Justification for strategies used to solve sustainability issues is documented for inclusion in work/project development records in accordance with professional standards

Note:

A licence or permit to practise in the workplace is required for specified work on building and premises

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and developing strategies to address sustainability issues.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK152A Electrical installation energy sustainability strategies

Evidence shall show an understanding of electrical installation energy sustainability strategies to an extent indicated by the following aspects:

T1 Energy management, legislation and regulation encompassing:

- Energy Management
- Climate Change
- Greenhouse Effect/Greenhouse Gases
- Standards and codes
- Legislation and regulations
- Energy Audits

T2 Electrical motors, pumps and fans encompassing:

- Motor Construction, Components & Losses
- Motor efficiency (MEPS - AS/NZS 1359.5)

T3 Appliances encompassing:

- Energy Star ratings
- Washing machines
- Clothes dryers
- Dishwashers
- Televisions and computers
- Standby Management strategies

T4 Energy efficient lighting encompassing:

- Lighting efficiency
- Efficient Lighting design
- Ballasts
- Lighting controls

T5 Water Heating encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Water heating systems and losses
- Electric, gas, oil, heat pump and solar water heater design
- Control strategies

T6 Space Heating and cooling encompassing:

- Space heating systems and losses
- Space cooling systems and losses
- Heating - Electric, gas, oil, heat pump and solar heater design
- Cooling – Direct expansion, chilled water and ventilation
- Control strategies

T7 Solar energy encompassing:

- System design fundamentals
- Solar PV design elements
- Solar PV system performance
- Analysis of system capital and operating cost performance

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some

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circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop strategies to address sustainability issues as described in 8) and including:

A	Understanding the extent of the electrical installation energy problem/s
B	Forming effective strategies for solution development and implementation
C	Obtaining energy system/component parameters, specifications and performance requirements appropriate to each problem
D	Testing solutions to energy problems
E	Documenting instruction for implementation of solutions that incorporate risk control measure to be followed
F	Documenting justification of solutions implemented in accordance with professional standards
G	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be

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clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) must be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to developing strategies to address sustainability issues for at least two types of electrical installations.

Note.

Typical sustainability issues are those encountered in meeting sustainability performance standards, such as reducing needs for energy use, reducing causes of greenhouse gas emissions, revising a energy system operating parameters and dealing with energy system efficiencies.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEK153A Assess energy loads and uses for energy efficiency in residential, office and retail premises

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the undertaking of energy audits of residential, small offices and retail premises to evaluate the energy efficiency of the premises and to make recommendation on design implementations. It encompasses working safely, apply extensive knowledge of electrical installations and components and their operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting engineering solutions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK152A	Develop strategies to address sustainability issues for electrical installations.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assess residential, office and retail premises for energy efficiency evaluation.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	The extent of the energy assessment are determined from premises orientation, premises floor plans, building structure plans, energy accounts, and situation reports and in consultation with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
	1.5	Effective strategies are determined to ensure solution development and implementation is carried out efficiently

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ELEMENT	PERFORMANCE CRITERIA	
2 Assess residential, office and retail premises for energy efficiency evaluation.	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Knowledge of energy loads is applied to developing energy efficient strategies to address energy use.
	2.3	Parameters, specifications and performance requirements in relation to energy use are set in accordance with established procedures
	2.4	Approaches to resolving sustainability issues are analysed to provide most effective solutions
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3 Document assessment of residential, office and retail premises for energy efficiency.	3.1	Solutions to energy use are tested to determine their effectiveness and modified where necessary
	3.2	Adopted solutions are documented, including instructions for implementation that incorporates risk control measures to be followed
	3.3	Appropriately competent and qualified persons required to implement solutions to energy use are coordinated in accordance with regulatory requirements and enterprise policy (See Note)
	3.4	Justification for strategies used to solve energy use is documented for inclusion in work/project development records in accordance with professional standards

Note:

A licence or permit to practise in the workplace is required for specified work on building and premises

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and assessment of energy loads in residential, office and retail premises.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK15 3A Residential, office and retail premises energy efficiency assessment

Evidence shall show an understanding of residential, office and retail premises energy efficiency assessment to an extent indicated by the following aspects:

T1 Energy management, legislation and regulation relevant to residential, office and retail premises encompassing:

- National Building Code of Australia
- State Building Codes
- Standards Australia for Energy Auditing
- Mandatory Disclosure
- State based legislation for energy management in business
- NABERS Tenancy
- NABERS Basix
- Minimum Renewable Energy T
- NatHERS ratings
- Renewable Energy Credits
- Small Technology Credits

T2 Water Supply and Use encompassing:

- collect and analyse information on household water use and on ways to improve water efficiency in the home
- ability to analyse the water consumption index for different sectors.
- ability to analyse domestic water use and ways to minimize the use of water.
- understanding on the methodology applied to water savings
- Perform water star rating calculations

T3 Greenhouse Gas Emissions encompassing:

- concept of Greenhouse Gas Emissions and Global Warming

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REQUIRED SKILLS AND KNOWLEDGE

- Fossil Fuel Resource Depletion and Mining impacts the environment
- breakdown of Energy Consumption in the Australian Domestic Sector

T4 Environmental Context – Ecological Impacts and Resource Use encompassing:

- concept of Greenhouse Gas Emissions and Global Warming
- Fossil Fuel Resource Depletion and Mining impacts the environment
- breakdown of Energy Consumption in the Australian Domestic Sector
- breakdown of Water Consumption in the Australian Domestic Sector

T5 Energy Efficiency Methodologies encompassing:

- Energy Services Approach and how it relates to energy auditing
- End User Focus and how it relates to energy auditing
- Opportunistic Approach and how it relates to energy auditing
- Understand and explain an Energy Management Strategy in relation to energy efficiency, energy management, demand management, fuel switching and renewable energy
- Explain what is meant by Financially Viable Best Practice Solutions
- Understand and explain a Water Management Strategy in relation to water efficiency, water management, source switching and water reuse/recycling
- understanding of the Opportunistic Best Practice Solutions in relation to water and explain how this differs from Financially Viable Best Practice Solutions
- Benchmarking with reference to Statistical Benchmarks, Technology Benchmarks and Best Practice Financially Viable Benchmark Methodologies
- Explain and calculate Best Practice Energy and Water Star Ratings
- Explain the Property Cost and Environmental Impact Tables in relation to reporting energy audit outcomes
- Explain the Sustainable Initiative Investment Tables in relation to reporting energy audit outcomes

T6 Energy and Society encompassing:

- understanding of Electricity Charges
- drivers of the predicted Electricity Price Increases in Australia

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REQUIRED SKILLS AND KNOWLEDGE

- Network Charge and Retail Charge Increases and how they relate to electricity price
- The Carbon Pollution Reduction Scheme impact on electricity prices
- Renewable Energy Target impact on electricity prices

T7 Energy Auditing Theory and Practice encompassing:

- scope of Australian Standards for energy auditing
- understanding of the Energy Audit Process in relation to Data collection, Analysis and the Communication of results
- understanding of Accounts, Bills and Data, Tariff Structures and the identification of Domestic Tariff Types
- understating of and proficiency in Energy and Energy Balance Calculations including power calculations, usage time calculations, power factor calculations and energy conversions from kWh to MJ
- understanding for the process involved in Onsite Assessment in a domestic and small business energy audit.
- knowledge on ways of gathering information on household energy use and costs
- Identify and mitigate the Risks and Hazards associated in a domestic and small business energy audit.
- Performing energy and power calculation
- Determine the Power Rating of Equipment and Metering and Measurement in a domestic and small business energy audit.
- Perform energy balance calculations
- Provide advice on ways to improve energy efficiency
- ability to perform Greenhouse Emission calculations, Emissions Factors, Carbon Intensity of Electricity vs. Natural Gas and LPG and Global Warming Potential and CO2 Equivalents
- ability to perform Financial Analysis in terms of Simple Payback and Simple Payback Period and Return on Investment or Rate of Return
- understanding for Reporting and Communication of energy audit results

T8 Water Auditing Services Theory and Design encompassing:

- understanding of water flow rates of taps, showers and irrigation, toilets, washing machines, dishwashers and filtration and top up water use for pool systems
- Performing a residential water meter reading
- understanding on the trends of water use and charges

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REQUIRED SKILLS AND KNOWLEDGE

- understanding of the Water Efficiency Labeling (WELS) Scheme as it relates to water auditing
- Identifying water efficiency opportunities in home sustainability assessments.
- operation of a Greywater System
- understanding of the factors that impact on Garden Water Demand

T9 Lighting Services Theory and Efficient Design encompassing:

- understanding for fundamental Illumination design for domestic and small business
- understanding for Illumination in terms of Light Output, Light Level and Brightness
- determine target light levels for differing tasks
- understanding of the characteristics of light sources including Efficacy, Colour Temperature and Colour Rendering Index
- understanding for the different Ballast types, their efficiency and benefits
- understanding of Incandescent Lamps, Halogen Lighting, Domestic Fluorescent Lighting and comparisons between these and applications for the domestic and small business sector
- understanding of the application of Lighting Methodology for Best Practice Energy Efficiency design
- understanding of Energy Saving Lighting Opportunities in the domestic and small business sector

T10 Thermal Performance and Climate Control encompassing:

- understanding of the Thermal Performance of a building impacts on Heating, Ventilation and Air Conditioning energy use including Orientation, Thermal Mass, Insulation, Glazing, Shading and Ventilation
- understanding of the Air Conditioning Designs including Ducted systems, Split-system air conditioners, Multi-headed split systems, Individual Room Air Conditioners (RAC), Through Wall / Window and Portable units
- Identifying ways for improving the thermal performance of a residential building envelop elements
- ability to apply the knowledge of Australian climate zones
- understanding of Air Conditioning Technologies including Refrigerated type air conditioning, Inverter type air conditioning, Reverse cycle air conditioning, Evaporative air conditioners, Breeze power systems and Digital Scroll Compressors

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REQUIRED SKILLS AND KNOWLEDGE

- understanding and the application of Energy Efficiency Ratio (EER) and Coefficient of Performance (COP) and show proficiency in EER and COP calculations
- understanding and the application of the Air Conditioning Star Ratings
- understanding of Gas and Electric Heating Options and air (ducted) heating
- understanding of the operation of an Air Conditioning System and describe each components including the compressor, evaporator, condenser, expansion valve and fan coil
- understanding of ceiling and pedestal fans and ventilation climate control
- understanding of the factors that impact on Climate Control Energy Consumption
- understanding of best practice Climate Control Methodology as applied to the domestic and small business sector
- understanding of the domestic and small business Climate Control Saving Opportunities
- ability to conduct a thermal performance assessment of a domestic residence

T11 Food Storage Services Theory and Efficient Design encompassing:

- understanding of refrigeration system basics operation
- understanding of different refrigeration models
- understanding of refrigeration characteristics including operation, automatic defrost, cooling temperature control, ice maker, ice and water dispenser, door seals and hinges
- understanding for the factors that impact on refrigerator energy use including size, configuration temperature setting, clearance around cabinet and ambient conditions, making ice, ice and water antisweat heaters, seals, insulation, compressor efficiency and age
- understanding of refrigerator & freezer star ratings
- understanding of food storage saving opportunities

T12 Food Preparation Services Theory and Efficient Design encompassing:

- understanding of different food preparation appliances
- understanding of the different operation of Gas and Electric hot plates and ovens and the advantages and disadvantages of each
- understanding for EMI food preparation methodology

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REQUIRED SKILLS AND KNOWLEDGE

- understanding for Food Preparation Saving Opportunities
- Food Preparation Services Theory and Efficient Design

T13 Water Heating Services Theory and Efficient Design encompassing:

- understanding for different water heaters including Electric and Gas Storage, Gas Instantaneous (Continuous Flow), Electric Heat Pump and Solar Hot Water Heaters
- understanding for solar water heater configurations and characteristics including Passive (or thermo siphon) systems and Active (or pumped) systems Solar Collector types, One Shot Booster
- knowledge of how RECs relate to Solar Water Heater RECs
- understanding of factors that influence water heater Energy Use including Pipework and Fitting Insulation, Atmospheric Conditions, Water Efficiency, Temperature Setting and Maintenance & Operation
- understanding of and proficiency in Water Heating / Cooling Calculations
- understanding of EMI Water Heating Methodology
- understanding of domestic Water Heating Saving Opportunities
- understanding of types of entertainment and administration appliances found in domestic residences

T14 Entertainment and Administration Services Theory and Efficient Design encompassing:

- understanding of appliance Standby Power including the different mode; Passive and Active Standby
- understanding of appliance Energy Star ratings
- understanding of MEPS and Labelling Requirements for Televisions
- an understanding of Computers energy consumption including computer power management
- understanding of Entertainment & Administration Saving Opportunities

T15 Cleaning Services Theory and Efficient Design encompassing:

- understanding of Clothes Washers types including Vertical axis and Horizontal axis
- understanding of factors that impact on clothes washing energy use
- understanding of energy and water MEPS Star Ratings and how they apply to clothes washers

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REQUIRED SKILLS AND KNOWLEDGE

- understanding of Clothes Dryer types including Spin Dryer, Condenser dryers, gas dryers and Heat pump dryers
- understanding of Clothes Dryer Controls
- understanding of Dishwasher types
- understanding of vacuum cleaner types
- understanding of EMI Cleaning Methodology
- understanding of domestic Cleaning Saving Opportunities

T16 Pumping Systems (and Pools) Theory and Efficient Design encompassing:

- understanding of Pumping Services in relation to domestic and the small business sector
- understanding of Pumping Types including centrifugal and positive displacement and pump selection and design
- understanding of Pumping Theory including Pressure Head, Pressure pumping vs. Transfer pumping, Pump Curves, Pump Best Efficiency (Operating) Point BEP, Variable Speed Drive, Energy Balance for a Typical Pumping System and Electric Motors
- understanding of the operationg of domestic pools in terms of Pool Pumps, Pool Backwashing, Cartridge Filters, Pools Turnovers, Pool Water Use and Pool Heating
- understanding of energy efficiency pool systems design methodology
- understanding of domestic pool systems saving opportunities

T17 Smart Metering Solutions encompassing:

- understanding and benefits of the different metering available to the domestic and the small business sector
- understanding of metering opportunities relation to domestic and the small business sector

T18 Renewable Energy (Solar PV) encompassing:

- understanding of design of Solar PV Systems and different panel types including Mono-crystalline, Poly-crystalline and Amorphous
- understanding of solar panel characteristics and choice of selection
- understanding of the Balance of Systems, Rules of Thumb, Shading, Orientation and Shading of strings in an on grid solar power system
- performing Solar PV energy calculations and calculate REC Entitlement for a Small Solar PV System

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REQUIRED SKILLS AND KNOWLEDGE

- understanding of the different Feed-in Tariff Schemes and how they apply to solar PV

T19 Energy Audit System encompassing:

- understanding of Domestic and Small Business Energy Audit Forms and Legend
- ability to conduct an Energy and Water Audit for the domestic and the small business sector
- understanding of Domestic and Small Business Sector Energy Audit Report

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carryout energy assessments to address energy efficiency issues as described in 8) and including:

A	Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
B	Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
C	Identifying the operational patterns in control of the user that impact on energy use and the energy services supplied by the energy technology that allow the quantifying energy use.
D	Perform an energy balance to model the current energy use to the existing energy bills.
E	Identifying effective energy saving opportunities to reduce energy use from
F	Understand the extent of the scope of the electrical and energy installation design problems, constraints and likely cost of installation.
G	Obtain energy system/component parameters, specifications and performance requirements appropriate to each problem.
H	Test and commission energy saving opportunity solutions to energy problems.
I	Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.
J	Document and report financial and technical justification of solutions implemented in

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	accordance with professional standards
K	Deal with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires

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assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) must be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to carrying out energy assessments and documenting energy efficiency strategies on at least two types of residential, office or small retail premises.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field

11)

Renewable and Sustainable Energy

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UEENEEK154A Assess energy loads and uses for energy efficiency in commercial facilities

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the undertaking of energy audits of commercial facilities to evaluate the energy efficiency of the facilities and to make recommendation on design implementations. It encompasses working safely, apply extensive knowledge of commercial electrical installations and components and their operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting engineering solutions.

Application of the Unit

Application of the Unit

2)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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License to practice **3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK153A	Assessment of energy loads and uses for energy efficiency in residential, office and retail dwellings.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills	**5)**
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to assess commercial facilities for energy efficiency evaluation.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work
		1.3	The extent of the energy assessment are determined from facilities orientation, facilities floor plans, building structure plans, energy accounts, and situation reports and in consultation with relevant persons
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
		1.5	Effective strategies are determined to ensure solution development and implementation is carried out efficiently

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ELEMENT	PERFORMANCE CRITERIA	
2 Assess commercial facilities for energy efficiency evaluation.	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Knowledge of energy loads is applied to developing energy efficient strategies to address energy use.
	2.3	Parameters, specifications and performance requirements in relation to energy use are set in accordance with established procedures
	2.4	Approaches to resolving energy uses are analysed to provide most effective solutions
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3 Document assessment of commercial facilities for energy efficiency.	3.1	Solutions to energy use are tested to determine their effectiveness and modified where necessary
	3.2	Adopted solutions are documented, including instructions for implementation that incorporates risk control measures to be followed
	3.3	Appropriately competent and qualified persons required to implement solutions to energy use are coordinated in accordance with regulatory requirements and enterprise policy (See Note)
	3.4	Justification for strategies used to solve energy use is documented for inclusion in work/project development records in accordance with professional standards

Note:

A licence or permit to practise in the workplace is required for specified work on building and facilities

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and assessment of energy loads in commercial facilities.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK154A Commercial facilities energy efficiency assessment

Evidence shall show an understanding of commercial facilities energy efficiency assessment to an extent indicated by the following aspects:

T1 Energy management, legislation and regulation relevant to residential, office and retail premises encompassing:

- National Building Code of Australia
- State Building Codes
- Standards Australia for Energy Auditing
- State based legislation for energy management in business
- NABERS Tenancy
- NABERS Office
- Building Energy Efficiency Certificates
- Minimum Renewable Energy
- Renewable Energy Credits
- Small Technology Credits

T2 Water supply and use encompassing:

- collecting and analysis of information for commercial facilities water use and methods to improve water efficiency in the home
- ability to analyse the water consumption index for different commercial sectors.
- ability to analyse commercial facilities water use and ways to minimize the use of water.
- understanding on the methodology applied to water savings
- calculate water star rating

T3 Environmental context – greenhouse gas emission, ecological impacts and resource use encompassing:

- concept of greenhouse gas emissions and global warming
- fossil fuel resource depletion and how mining impacts the

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REQUIRED SKILLS AND KNOWLEDGE

environment

- breakdown of energy consumption in the Australian commercial sector
- breakdown of water consumption in the Australian commercial sector

T4 Energy efficiency methodologies encompassing:

- Energy services approach and relationship to energy auditing
- End user focus and relationship to energy auditing
- Opportunistic approach and relationship to energy auditing
- Energy management strategy in relationship to energy efficiency, energy management, demand management, fuel switching and renewable energy
- Financially viable best practice solutions; including net present value and internal rate of return
- Water management strategy in relationship to water efficiency, water management, source switching and water reuse/recycling
- Opportunistic best practice solutions in relationship to water and the differences to the financially viable best practice solutions
- Benchmarking with reference to statistical benchmarks, technology benchmarks and best practice financially viable benchmark methodologies
- Calculate best practice energy and water star ratings
- Property cost and environmental impact tables in relationship to reporting energy audit outcomes
- Sustainable initiative investment tables in relationship to reporting energy audit outcomes

T5 Energy and society encompassing:

- understanding of electricity charges
- drivers of the predicted electricity price increases in Australia
- Network charge and retail charge increases and how they relate to electricity price
- The Carbon tax or similar and impact on electricity prices
- Renewable Energy Target and impact on electricity prices
- Impact of electricity prices to commercial facilities

T6 Energy auditing and practice encompassing:

- scope of Australian Standards for energy auditing
- Energy audit process in relationship to data collection, analysis and the communication of results

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REQUIRED SKILLS AND KNOWLEDGE

- Accounts, bills and data, tariff structures and the identification of commercial tariff types
- Calculate energy and energy balance including power calculations, usage time calculations, power factor calculations and energy conversions from kWh to MJ
- process involved in onsite assessment in a commercial facilities energy audit.
- gathering information on commercial facilities energy use and costs
- Risks and hazards associated in a commercial facilities energy audit.
- Calculate energy and power
- Power rating of equipment and metering and measurement in a commercial facilities energy audit.
- Calculate energy balance for commercial facilities
- Advice on ways to improve energy efficiency
- Calculate greenhouse emission, emissions factors, carbon intensity of electricity vs. natural gas and LPG and global warming potential and CO2 equivalents
- Financial analysis in terms of simple payback and simple payback period and return on investment or rate of return
- Reporting and communication of energy audit results

T7 Energy management encompassing:

- energy management strategies.
- practice based energy management.
- technology based energy management.
- Interaction between human resources and practice based control.
- Application of technology based energy management.
- Identify potential energy savings from application of energy management

T8 Power and energy data recording encompassing:

- Identify the structure and purpose of power and energy data recording for whole systems and equipment.
- Review or develop single line schematic of electrical system of a commercial facility
- Establish the power and energy data gap from the energy audit in T7 to achieve Australian Standard compliant energy audits.
- Identify electrical loads that need contribute more than 5% of energy use

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REQUIRED SKILLS AND KNOWLEDGE

- Understand and explain the operation seven different power and energy monitoring equipment available
- Understand the implications of data recording intervals for monitoring equipment
- Develop a power and energy monitoring strategy for a commercial facility
- Deploy commercial facility power and energy monitoring strategy
- Draw conclusions and report on power and energy data collection in a commercial facility

T9 Water auditing services and design encompassing:

- Water flow rates of taps, showers and irrigation, toilets, washing machines, dishwashers and filtration and top up water use for cooling towers and pool systems
- Commercial facility water meter reading
- Trends of water use and charges for commercial facilities
- Water Efficiency Labelling (WELS) Scheme as it relates to water auditing
- Identification of water efficiency opportunities in commercial facility assessments.
- Operation of a rain water and grey water systems
- Factors that impact on landscape water demand

T10 Lighting services and efficient design encompassing:

- Fundamental illumination design for commercial facilities
- Illumination terms: light output, light level and brightness
- Determining target light levels for differing tasks
- Characteristics of light sources including efficacy, colour temperature and colour rendering index
- Ballast types, their efficiency and benefits
- Incandescent lamps, LED, Induction Lamps, halogen lighting, commercial fluorescent lighting, metal halide, mercury vapour and comparisons between these and applications for the commercial facilities
- Application of lighting methodology for best practice energy efficiency design
- Energy saving lighting opportunities in the commercial facilities

T11 Thermal performance and climate control encompassing:

- Thermal performance of a building impacts on heating, ventilation and air conditioning energy use including

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REQUIRED SKILLS AND KNOWLEDGE

orientation, thermal mass, insulation, glazing, shading and ventilation

- Air conditioning designs including central, ducted systems, split-system air conditioners, multi-headed split systems, individual room air conditioners (RAC), through wall / window and portable units
- Improvement to air movement systems in commercial facilities including diffusers
- Improvement to ventilation systems in commercial facilities
- improvement of thermal performance of a commercial building envelop elements
- ability to apply the knowledge of Australian climate zones
- Air conditioning technologies including refrigerated type air conditioning, inverter type air conditioning, reverse cycle air conditioning, evaporative air conditioners, breeze power systems and digital scroll compressors
- application of Energy Efficiency Ratio (EER) and Coefficient of Performance (COP) and show proficiency in EER and COP calculations
- application of the Air Conditioning Star Ratings to commercial facilities
- Gas and electric heating options and air (ducted) heating
- operation of an air conditioning system and describe each components including the compressor, evaporator, condenser, expansion valve and fan coil
- ceiling and pedestal fans and ventilation climate control
- factors that impact on climate control energy consumption
- best practice climate control methodology as applied to the commercial facilities
- commercial facilities climate control saving opportunities
- conducting thermal performance assessment of a commercial facilities

T12 Food storage services and efficient design encompassing:

- refrigeration system basics operation
- different refrigeration models
- refrigeration characteristics including operation, automatic defrost, cooling temperature control, ice maker, ice and water dispenser, door seals and hinges
- factors that impact on refrigerator energy use including size, configuration temperature setting, clearance around cabinet and ambient conditions, making ice, ice and water antisweat heaters,

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REQUIRED SKILLS AND KNOWLEDGE

seals, insulation, compressor efficiency and age

- Refrigerator and freezer star ratings
- Cold room and freezer room energy saving opportunities
- Food storage saving opportunities

T13 Food preparation services and efficient design encompassing:

- different food preparation appliances
- different operation of gas and electric hot plates and ovens and the advantages and disadvantages of each
- EMI food preparation methodology
- Food preparation saving opportunities
- Food preparation services and efficient design

T14 Water heating services and efficient design encompassing:

- different water heaters including electric and gas storage, gas instantaneous (continuous flow), electric heat pump and solar hot water heaters
- solar water heater configurations and characteristics including passive (or thermo siphon) systems and active (or pumped) systems solar collector types, one shot booster
- RECs and STCs and how these relate to solar water heater STCs
- factors that influence water heater energy use including pipework and fitting insulation, atmospheric conditions, water efficiency, temperature setting and maintenance & operation
- Water heating / cooling calculations
- EMI water heating methodology
- commercial water heating saving opportunities
- types of entertainment and administration appliances found in commercial residences

T15 Entertainment and administration services and efficient design encompassing:

- appliance standby power including the different mode; passive and active standby
- appliance energy star ratings
- MEPS and labelling requirements for televisions
- Network standby management strategies
- Computers energy consumption including computer power management
- Entertainment and administration saving opportunities

T16 Cleaning services and efficient design encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- clothes washers types including vertical axis and horizontal axis
- factors that impact on clothes washing energy use
- energy and water MEPS star ratings and how they apply to clothes washers
- Clothes dryer types including spin dryer, condenser dryers, gas dryers and heat pump dryers
- Clothes dryer controls
- Dishwasher types
- vacuum cleaner types
- EMI cleaning methodology
- commercial cleaning saving opportunities

T17 Pumping systems (and pools) and efficient design encompassing:

- Pumping services in relation to commercial sector
- Pumping types including centrifugal and positive displacement and pump selection and design
- Pumping theory including pressure head, pressure pumping vs. transfer pumping, pump curves, pump best efficiency (operating) point bep, variable speed drive, energy balance for a typical pumping system and electric motors
- operating of commercial pools in terms of pool pumps, pool backwashing, cartridge filters, pools turnovers, pool water use and pool heating
- Energy efficiency pool systems design methodology
- Energy efficiency hot water, chilled and condenser water pumping systems
- Commercial pool systems saving opportunities

T18 Smart metering solutions encompassing:

- benefits of the different metering available to the commercial sector
- metering opportunities relation to commercial sector

T19 Renewable energy (solar PV) encompassing:

- design of solar PV systems and different panel types including mono-crystalline, poly-crystalline and amorphous
- solar panel characteristics and choice of selection
- solar power system utility approval process
- Balance of systems, rules of thumb, shading, orientation and shading of strings in an on grid solar power system
- Solar PV energy calculations and calculate REC entitlement for

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REQUIRED SKILLS AND KNOWLEDGE

a small solar PV system

- different feed-in tariff schemes and how they apply to solar PV

T20 Energy audit system encompassing:

- Commercial facilities energy audit forms and legend
- Conducting energy and water audit for the commercial sector
- Commercial facilities sector energy audit report

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity,

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electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment

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- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carryout energy assessments to address energy efficiency issues as described in 8) and including:

A	Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
B	Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
C	Identifying the operational patterns in control of the user that impact on energy use and the energy services supplied by the energy technology that allow the quantifying energy use.
D	Perform an energy balance to model the current energy use to the existing energy bills.
E	Identifying effective energy saving opportunities to reduce energy use from
F	Understand the extent of the scope of the electrical and energy installation design problems, constraints and likely cost of installation.
G	Obtain energy system/component parameters, specifications and performance requirements appropriate to each problem.
H	Test and commission energy saving opportunity solutions to energy problems.
I	Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.
J	Document and report financial and technical justification of solutions implemented in accordance with professional standards
K	Deal with unplanned events by drawing on essential knowledge and skills to provide

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appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assessment of energy loads found in commercial facilities.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended

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primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) must be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to carrying out energy assessments and documenting energy efficiency strategies on at least two commercial facilities.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field

11)

Renewable and Sustainable Energy

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UEENEEK155A Assess energy loads and uses for energy efficiency in industrial properties and enterprises

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the undertaking of energy audits of industrial properties and enterprises to evaluate the energy efficiency of the facilities and to make recommendation on design implementations. It encompasses working safely, apply extensive knowledge of industrial electrical installations and components and their operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting engineering solutions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where

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License to practice **3)**

applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK153A	Assessment of energy loads and uses for energy efficiency in residential, office and retail dwellings.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assess industrial properties and enterprises for energy efficiency evaluation.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	The extent of the energy assessment are determined from facilities orientation, facilities floor plans, building structure plans, energy accounts, and situation reports and in consultation with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
	1.5	Effective strategies are determined to ensure solution development and implementation is carried out efficiently

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ELEMENT		PERFORMANCE CRITERIA	
2	Assess industrial properties and enterprises for energy efficiency evaluation.	2.1	OHS risk control measures and procedures for carrying out the work are followed
		2.2	Knowledge of energy loads is applied to developing energy efficient strategies to address energy use.
		2.3	Parameters, specifications and performance requirements in relation to energy use are set in accordance with established procedures
		2.4	Approaches to resolving energy uses are analysed to provide most effective solutions
		2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
		2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3	Document assessment of industrial properties and enterprises for energy efficiency.	3.1	Solutions to energy use are tested to determine their effectiveness and modified where necessary
		3.2	Adopted solutions are documented, including instructions for implementation that incorporates risk control measures to be followed
		3.3	Appropriately competent and qualified persons required to implement solutions to energy use are coordinated in accordance with regulatory requirements and enterprise policy (See Note)
		3.4	Justification for strategies used to solve energy use is documented for inclusion in work/project development records in accordance with professional standards

Note:

A licence or permit to practise in the workplace is required for specified work on building and facilities

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and assessment of energy loads in industrial properties and enterprises.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EK155A Industrial properties and enterprises energy efficiency assessment

Evidence shall show an understanding of industrial properties and enterprises energy efficiency assessment to an extent indicated by the following aspects:

T1 Energy management, legislation and regulation relevant to industrial properties and enterprises encompassing:

- National Building Code of Australia
- Standards Australia for Energy Auditing
- State based legislation for energy management in business
- Energy Efficiency Opportunities Act
- State energy reporting schemes
- Minimum Renewable Energy
- Renewable Energy Credits
- Small Technology Credits

T2 Water supply and use encompassing:

- collecting and analysis of information for industrial facilities water use and methods to improve water efficiency in the industrial facilities
- ability to analyse the water consumption index for different Industrial sectors.
- ability to analyse Industrial facilities water use and ways to minimize the use of water.
- understanding on the methodology applied to water savings
- calculate water star rating

T3 Environmental context – greenhouse gas emission, ecological impacts and resource use encompassing:

- concept of greenhouse gas emissions and global warming
- fossil fuel resource depletion and how mining impacts the

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REQUIRED SKILLS AND KNOWLEDGE

environment

- breakdown of energy consumption in the Australian Industrial sector
- breakdown of water consumption in the Australian Industrial sector

T4 Energy efficiency methodologies encompassing:

- Energy services approach and relationship to energy auditing
- End user focus and relationship to energy auditing
- Opportunistic approach and relationship to energy auditing
- Energy management strategy in relationship to energy efficiency, energy management, demand management, fuel switching and renewable energy
- Financially viable best practice solutions; including net present value and internal rate of return
- Water management strategy in relationship to water efficiency, water management, source switching and water reuse/recycling
- Opportunistic best practice solutions in relationship to water and the differences to the financially viable best practice solutions
- Benchmarking with reference to statistical benchmarks, technology benchmarks and best practice financially viable benchmark methodologies
- Calculate best practice energy and water star ratings
- Property cost and environmental impact tables in relationship to reporting energy audit outcomes
- Sustainable initiative investment tables in relationship to reporting energy audit outcomes

T5 Energy and society encompassing:

- understanding of electricity charges
- drivers of the predicted electricity price increases in Australia
- Network charge and retail charge increases and how they relate to electricity price
- The Carbon tax or similar and impact on electricity prices
- Renewable Energy Target and impact on electricity prices
- Impact of electricity prices to Industrial facilities

T6 Energy auditing and practice encompassing:

- scope of Australian Standards for energy auditing
- Energy audit process in relationship to data collection, analysis and the communication of results

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REQUIRED SKILLS AND KNOWLEDGE

- Accounts, bills and data, tariff structures and the identification of Industrial tariff types
- Calculate energy and energy balance including power calculations, usage time calculations, power factor calculations and energy conversions from kWh to MJ
- process involved in onsite assessment in a Industrial facilities energy audit.
- gathering information on Industrial facilities energy use and costs
- Risks and hazards associated in a Industrial facilities energy audit.
- Calculate energy and power
- Power rating of equipment and metering and measurement in a Industrial facilities energy audit.
- Calculate energy balance for Industrial facilities
- Advice on ways to improve energy efficiency
- Calculate greenhouse emission, emissions factors, carbon intensity of electricity vs. natural gas and LPG and global warming potential and CO2 equivalents
- Financial analysis in terms of simple payback and simple payback period and return on investment or rate of return
- Reporting and communication of energy audit results

T7 Energy management encompassing:

- energy management strategies.
- practice based energy management.
- technology based energy management.
- Interaction between human resources and practice based control.
- Application of technology based energy management.
- Identify potential energy savings from application of energy management

T8 Power and energy data recording encompassing:

- Identify the structure and purpose of power and energy data recording for whole systems and equipment.
- Review or develop single line schematic of electrical system of a Industrial facility
- Establish the power and energy data gap from the energy audit in T7 to achieve Australian Standard compliant energy audits.
- Identify electrical loads that need contribute more than 5% of energy use

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REQUIRED SKILLS AND KNOWLEDGE

- Understand and explain the operation seven different power and energy monitoring equipment available
- Understand the implications of data recording intervals for monitoring equipment
- Develop a power and energy monitoring strategy for a Industrial facility
- Deploy Industrial facility power and energy monitoring strategy
- Draw conclusions and report on power and energy data collection in a Industrial facility

T9 Water auditing services and design encompassing:

- Water flow rates of taps, showers and irrigation, toilets, washing machines, dishwashers and filtration and top up water use for cooling towers and pool systems
- Industrial facility water meter reading
- Trends of water use and charges for Industrial facilities
- Water Efficiency Labelling (WELS) Scheme as it relates to water auditing
- Identification of water efficiency opportunities in Industrial facility assessments.
- Operation of a rain water and grey water systems
- Factors that impact on landscape water demand

T10 Lighting services and efficient design encompassing:

- Fundamental illumination design for Industrial facilities
- Illumination terms: light output, light level and brightness
- Determining target light levels for differing tasks
- Characteristics of light sources including efficacy, colour temperature and colour rendering index
- Ballast types, their efficiency and benefits
- Incandescent lamps, LED, Induction Lamps, halogen lighting, Industrial fluorescent lighting, metal halide, mercury vapour and comparisons between these and applications for the Industrial facilities
- Application of lighting methodology for best practice energy efficiency design
- Energy saving lighting opportunities in the Industrial facilities

T11 Thermal performance and climate control encompassing:

- Thermal performance of a building impacts on heating, ventilation and air conditioning energy use including

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REQUIRED SKILLS AND KNOWLEDGE

orientation, thermal mass, insulation, glazing, shading and ventilation

- Air conditioning designs including central, ducted systems, split-system air conditioners, multi-headed split systems, individual room air conditioners (RAC), through wall / window and portable units
- Improvement to air movement systems in Industrial facilities including diffusers
- Improvement to ventilation systems in Industrial facilities
- improvement of thermal performance of a Industrial building envelop elements
- ability to apply the knowledge of Australian climate zones
- Air conditioning technologies including refrigerated type air conditioning, inverter type air conditioning, reverse cycle air conditioning, evaporative air conditioners, breeze power systems and digital scroll compressors
- application of Energy Efficiency Ratio (EER) and Coefficient of Performance (COP) and show proficiency in EER and COP calculations
- application of the Air Conditioning Star Ratings to Industrial facilities
- Gas and electric heating options and air (ducted) heating
- operation of an air conditioning system and describe each components including the compressor, evaporator, condenser, expansion valve and fan coil
- ceiling and pedestal fans and ventilation climate control
- factors that impact on climate control energy consumption
- best practice climate control methodology as applied to the Industrial facilities
- Industrial facilities climate control saving opportunities
- conducting thermal performance assessment of a Industrial facilities

T12 Product storage services and efficient design encompassing:

- Industrial refrigeration system basic operation
- different industrial refrigeration chilling methods and system elements
- Industrial refrigeration characteristics including operation, cooling and heat loads calculations, operational performance,
- factors that impact on industrial refrigeration energy use including size, configuration temperature setting, heat load, cooling time, seals, insulation, compressor efficiency and age

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REQUIRED SKILLS AND KNOWLEDGE

- Industrial cold rooms and freezer rooms energy saving opportunities
- Product storage saving opportunities

T13 Food preparation services and efficient design encompassing:

- different food preparation appliances
- different operation of gas and electric hot plates and ovens and the advantages and disadvantages of each
- EMI food preparation methodology
- Food preparation saving opportunities
- Food preparation services and efficient design

T14 Water heating services and efficient design encompassing:

- different water heaters including electric and gas storage, gas instantaneous (continuous flow), electric heat pump and solar hot water heaters
- solar water heater configurations and characteristics including passive (or thermo siphon) systems and active (or pumped) systems solar collector types, one shot booster
- RECs and STCs and how these relate to solar water heater STCs
- factors that influence water heater energy use including pipework and fitting insulation, atmospheric conditions, water efficiency, temperature setting and maintenance & operation
- Water heating / cooling calculations
- EMI water heating methodology
- Industrial water heating saving opportunities
- types of entertainment and administration appliances found in Industrial residences

T15 Entertainment and administration services and efficient design encompassing:

- appliance standby power including the different mode; passive and active standby
- appliance energy star ratings
- MEPS and labelling requirements for televisions
- Network standby management strategies
- Computers energy consumption including computer power management
- Entertainment and administration saving opportunities

T16 Industrial services and efficient design encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Compressed air, hydraulic and steam systems
- Overview of industrial services in relation to Industrial sector
- Compressed air, hydraulic and steam system selection and design
- Compressed air, hydraulic and steam system theory, energy balance for a typical systems in industrial processes
- Energy efficiency pumping compressed air, hydraulic and steam systems design methodology
- Energy efficiency compressed air, hydraulic and steam systems
- Industrial pumping compressed air, hydraulic and steam systems saving opportunities

T17 Industrial cogeneration services and efficient design encompassing:

- Cogeneration systems
- Overview of industrial cogeneration systems in relation to Industrial sector
- Cogeneration system selection and design
- Cogeneration system theory, energy balance for a typical systems in industrial processes
- Energy efficiency cogeneration systems design methodology
- Energy efficiency cogeneration systems
- Industrial cogeneration systems saving opportunities

T18 Pumping systems (and pools) and efficient design encompassing:

- Pumping services in relation to Industrial sector
- Pumping types including centrifugal and positive displacement and pump selection and design
- Pumping theory including pressure head, pressure pumping vs. transfer pumping, pump curves, pump best efficiency (operating) point bep, variable speed drive, energy balance for a typical pumping system and electric motors
- operating of water pumps in industrial processes
- Energy efficiency pumping systems design methodology
- Energy efficiency pumping systems
- Industrial pumping systems saving opportunities

T19 Smart metering solutions encompassing:

- benefits of the different metering available to the Industrial sector
- metering opportunities relation to Industrial sector

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REQUIRED SKILLS AND KNOWLEDGE

T20 Renewable energy (solar PV) encompassing:

- design of solar PV systems and different panel types including mono-crystalline, poly-crystalline and amorphous
- solar panel characteristics and choice of selection
- solar power system utility approval process
- Balance of systems, rules of thumb, shading, orientation and shading of strings in an on grid solar power system
- Solar PV energy calculations and calculate REC entitlement for a small solar PV system
- different feed-in tariff schemes and how they apply to solar PV

T21 Energy audit system encompassing:

- Industrial facilities energy audit forms and legend
- Conducting energy and water audit for the Industrial sector
- Industrial facilities sector energy audit report

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the

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workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range

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statement

- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carryout energy assessments to address energy efficiency issues as described in 8) and including:

A	Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
B	Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
C	Identifying the operational patterns in control of the user that impact on energy use and the energy services supplied by the energy technology that allow the quantifying energy use.
D	Perform an energy balance to model the current energy use to the existing energy bills.
E	Identifying effective energy saving opportunities to reduce energy use from
F	Understand the extent of the scope of the electrical and energy installation design problems, constraints and likely cost of installation.
G	Obtain energy system/component parameters, specifications and performance requirements appropriate to each problem.
H	Test and commission energy saving opportunity solutions to energy problems.

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I	Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.
J	Document and report financial and technical justification of solutions implemented in accordance with professional standards
K	Deal with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assessment of energy loads found in industrial properties and enterprises.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) must be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to carrying out energy assessments and documenting energy efficiency strategies on at least two industrial properties/enterprises.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy

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UEENEEM019A Attend to breakdowns in hazardous areas - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEI112A - Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite MEM07001B - Perform operational maintenance of machines/equipment	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of attending to a breakdown in a hazardous area or of explosion-protected and associated equipment. It requires the ability to ascertain the nature of a breakdown, the extent of repairs required and the personnel needed to repair the breakdown.

This unit is directly equivalent to the Unit *2.3 Attend to breakdowns in hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies and is intended to apply to plant/equipment service and maintenance job functions in the disciplines of electrical, instrumentation, communication or mechanics at AQF 3 level or higher. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

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Prerequisite Unit(s) **2)**

Competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
MEM7001B	Perform operational maintenance of machines/equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to attend breakdown.	1.1	Nature of the breakdown is confirmed with appropriate personnel to establish the need to enter the hazardous area.
	1.2	Maintenance records of equipment related to the reported breakdown are review for possible causes.
	1.3	Safety to enter the hazardous area is established in accordance with established procedures and relevant clearance to do the work is obtained.
	1.4	Testing devices and tools, anticipated as being needed for the work, are obtained and checked for correct operation and safety.
2 Evaluate extent of work.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Extent of breakdown is evaluated and confirmed with appropriate personnel.
	2.3	Other personnel required to determine cause and rectify breakdown is ascertained from available evidence and arrangements made for their attendance where applicable.
	2.4	Extent of repair work is ascertained from available evidence and confirmed with appropriate personnel.
	2.5	Limits of repair work that can be carried out in-situ are established with regards to explosion risk and in accordance with established procedures and requirements.
3 Arrange repair work.	3.1	Equipment is isolated in accordance with established procedures.
	3.2	Circuits of equipment being withdrawn from service are terminated or isolated safely and in manner approved for the classification of the area.
	3.3	Certification documentation for replacement equipment is sighted to ensure that it is identical

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ELEMENT	PERFORMANCE CRITERIA	
		with the equipment it replaces and is in accordance with the explosion-protection system design.
	3.4	Repair work carried out in-situ is done in accordance with established procedures and requirements.
4 Confirm completion of work.	4.1	Explosion-protected equipment and systems are inspected and tested by appropriately qualified personnel after repairs are completed to ensure the integrity of the system.
	4.2	Appropriate personnel are notified of the completion of the repair work and details are documented in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and attending to breakdowns in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM01 9A Explosion protection, certification and techniques

Evidence shall show an understanding of Ex certification schemes and techniques to accepted Standards to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Attend to breakdowns in hazardous areas as described in 8) and including:

    A Following work permits and clearance procedures

    B Monitoring hazards and following evacuation procedures

    C Following plant and electrical isolation procedures

    D Correctly evaluating extent of breakdowns

    E Interpreting certification documentation in relation

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to repair and replacement

F Following established breakdown procedures

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to attending to breakdowns in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of

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explosion-protected equipment in a hazardous area

Competency unit in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF 3 or equivalent chosen as a prerequisite.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof (enclosures only) , (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')

Note: 'I' signifies Group I equipment

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM020A Attend to breakdowns in hazardous areas - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEI112A - Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite MEM07001B - Perform operational maintenance of machines/equipment	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of attending to a breakdown in a hazardous area or of explosion-protected and associated equipment. It requires the ability to ascertain the nature of a breakdown, the extent of repairs required and the personnel needed to repair the breakdown.

This unit is directly equivalent to the Unit *2.3 Attend to breakdowns in hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies and is intended to apply to plant/equipment service and maintenance job functions in the disciplines of electrical, instrumentation, communication or at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

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Prerequisite Unit(s) **2)**

Competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
MEM07001B	Perform operational maintenance of machines/equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to attend breakdown.	1.1	Nature of the breakdown is confirmed with appropriate personnel to establish the need to enter the hazardous area.
	1.2	Maintenance records of equipment related to the reported breakdown are review for possible causes.
	1.3	Safety to enter the hazardous area is established in accordance with established procedures and relevant clearance to do the work is obtained.
	1.4	Testing devices and tools, anticipated as being needed for the work, are obtained and checked for correct operation and safety.
2 Evaluate extent of work.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Extent of breakdown is evaluated and confirmed with appropriate personnel.
	2.3	Other personnel required to determine cause and rectify breakdown is ascertained from available evidence and arrangements made for their attendance where applicable.
	2.4	Extent of repair work is ascertained from available evidence and confirmed with appropriate personnel.
	2.5	Limits of repair work that can be carried out in-situ are established with regards to explosion risk and in accordance with established procedures and requirements.
3 Arrange repair work.	3.1	Equipment is isolated in accordance with established procedures.
	3.2	Circuits of equipment being withdrawn from service are terminated or isolated safely and in manner approved for the classification of the area.
	3.3	Certification documentation for replacement equipment is sighted to ensure that it is identical

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ELEMENT	PERFORMANCE CRITERIA	
		with the equipment it replaces and is in accordance with the explosion-protection system design.
	3.4	Repair work carried out in-situ is done in accordance with established procedures and requirements.
4 Confirm completion of work.	4.1	Explosion-protected equipment and systems are inspected and tested by appropriately qualified personnel after repairs are completed to ensure the integrity of the system.
	4.2	Appropriate personnel are notified of the completion of the repair work and details are documented in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and attending to breakdowns in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM020 A Explosion protection, certification and techniques

Evidence shall show an understanding of Ex certification schemes and techniques to accepted Standards to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Attend to breakdowns in hazardous areas as described in 8) and including:

    A Following work permits and clearance procedures

    B Monitoring hazards and following evacuation procedures

    C Following plant and electrical isolation procedures

    D Correctly evaluating extent of breakdowns

    E Interpreting certification documentation in relation

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to repair and replacement

F Following established breakdown procedures

G Applying relevant contingency management skills

Context of and specific resources for assessment

9.3) **This unit should be assessed as it relates to normal work practice using procedures**, **information and resources typical of a workplace**. **This should include**:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to attending to breakdowns in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

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Competency unit in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF 3 or equivalent chosen as a prerequisite.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM021A Attend to breakdowns in hazardous areas - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEI112A - Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite MEM07001B - Perform operational maintenance of machines/equipment	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of attending to a breakdown in a hazardous area or of explosion-protected and associated equipment. It requires the ability to ascertain the nature of a breakdown, the extent of repairs required and the personnel needed to repair the breakdown.

This unit is directly equivalent to the Unit *2.3 Attend to breakdowns in hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies and is intended to apply to plant/equipment service and maintenance job functions in the disciplines of electrical, instrumentation, communication or mechanics at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

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Prerequisite Unit(s) **2)**

Competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105B	Verify compliance and functionality of low voltage general electrical installations
UEENEEI112B	Verify compliance and functionality of instrumentation and control installations
MEM7001B	Perform operational maintenance of machines/equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to attend breakdown.	1.1	Nature of the breakdown is confirmed with appropriate personnel to establish the need to enter the hazardous area.
	1.2	Maintenance records of equipment related to the reported breakdown are review for possible causes.
	1.3	Safety to enter the hazardous area is established in accordance with established procedures and relevant clearance to do the work is obtained.
	1.4	Testing devices and tools, anticipated as being needed for the work, are obtained and checked for correct operation and safety.
2 Evaluate extent of work.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Extent of breakdown is evaluated and confirmed with appropriate personnel.
	2.3	Other personnel required to determine cause and rectify breakdown is ascertained from available evidence and arrangements made for their attendance where applicable.
	2.4	Extent of repair work is ascertained from available evidence and confirmed with appropriate personnel.
	2.5	Limits of repair work that can be carried out in-situ are established with regards to explosion risk and in accordance with established procedures and requirements.
3 Arrange repair work.	3.1	Equipment is isolated in accordance with established procedures.
	3.2	Circuits of equipment being withdrawn from service are terminated or isolated safely and in manner approved for the classification of the area.
	3.3	Certification documentation for replacement equipment is sighted to ensure that it is identical

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ELEMENT	PERFORMANCE CRITERIA	
		with the equipment it replaces and is in accordance with the explosion-protection system design.
	3.4	Repair work carried out in-situ is done in accordance with established procedures and requirements.
4 Confirm completion of work.	4.1	Explosion-protected equipment and systems are inspected and tested by appropriately qualified personnel after repairs are completed to ensure the integrity of the system.
	4.2	Appropriate personnel are notified of the completion of the repair work and details are documented in accordance with established procedures and requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and attending to breakdowns in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

2.22.2.2	Explosion-protection equipment Ex certification schemes
2.22.3	Flameproof (Ex'd') explosion-protection technique
2.22.4	Increased safety (Ex'e') explosion-protection technique
2.22.5	Non-sparking (Ex'n') explosion-protection technique

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REQUIRED SKILLS AND KNOWLEDGE

2.22.6 Intrinsic safety (Ex'i') explosion-protection technique

2.22.7 Pressurization (Ex'p') explosion-protection technique

2.22.8 Explosion-protection techniques for dusts

2.22.9 Common characteristics of explosion-protection techniques

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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EVIDENCE GUIDE

Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Attend to breakdowns in hazardous areas as described in 8) and including:

    A Following work permits and clearance procedures.

    B Monitoring hazards and following evacuation procedures.

    C Following plant and electrical isolation procedures.

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D Correctly evaluating extent of breakdowns.

E Interpreting certification documentation in relation to repair and replacement.

F Following established breakdown procedures.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to attending to breakdowns in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

For optimisation of training and assessment effort, competency

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EVIDENCE GUIDE

other units	development in this unit may be arranged concurrently with unit: UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area Competency unit in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF 3 or equivalent chosen as a prerequisite.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM022A Attend to breakdowns in hazardous areas - pressurisation

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEI112A - Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite MEM07001B - Perform operational maintenance of machines/equipment	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of attending to a breakdown in a hazardous area or of explosion-protected and associated equipment. It requires the ability to ascertain the nature of a breakdown, the extent of repairs required and the personnel needed to repair the breakdown.

This unit is directly equivalent to the Unit *2.3 Attend to breakdowns in hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies and is intended to apply to plant/equipment service and maintenance job functions in the disciplines of electrical, instrumentation, communication or mechanics at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

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Prerequisite Unit(s) **2)**

Competencies in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105B	Verify compliance and functionality of low voltage general electrical installations
UEENEEI112B	Verify compliance and functionality of instrumentation and control installations
MEM7001B	Perform operational maintenance of machines/equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to attend breakdown.	1.1	Nature of the breakdown is confirmed with appropriate personnel to establish the need to enter the hazardous area.
	1.2	Maintenance records of equipment related to the reported breakdown are review for possible causes.
	1.3	Safety to enter the hazardous area is established in accordance with established procedures and relevant clearance to do the work is obtained.
	1.4	Testing devices and tools, anticipated as being needed for the work, are obtained and checked for correct operation and safety.
2 Evaluate extent of work.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Extent of breakdown is evaluated and confirmed with appropriate personnel.
	2.3	Other personnel required to determine cause and rectify breakdown is ascertained from available evidence and arrangements made for their attendance where applicable.
	2.4	Extent of repair work is ascertained from available evidence and confirmed with appropriate personnel.
	2.5	Limits of repair work that can be carried out in-situ are established with regards to explosion risk and in accordance with established procedures and requirements.
3 Arrange repair work.	3.1	Equipment is isolated in accordance with established procedures.
	3.2	Circuits of equipment being withdrawn from service are terminated or isolated safely and in manner approved for the classification of the area.
	3.3	Certification documentation for replacement equipment is sighted to ensure that it is identical

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ELEMENT	PERFORMANCE CRITERIA	
		with the equipment it replaces and is in accordance with the explosion-protection system design.
	3.4	Repair work carried out in-situ is done in accordance with established procedures and requirements.
4 Confirm completion of work.	4.1	Explosion-protected equipment and systems are inspected and tested by appropriately qualified personnel after repairs are completed to ensure the integrity of the system.
	4.2	Appropriate personnel are notified of the completion of the repair work and details are documented in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and attending to breakdowns in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM02 2A Explosion protection, certification and techniques

Evidence shall show an understanding of Ex certification schemes and techniques to accepted Standards to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Attend to breakdowns in hazardous areas as described in 8) and including:

    A Following work permits and clearance procedures

    B Monitoring hazards and following evacuation procedures

    C Following plant and electrical isolation procedures

    D Correctly evaluating extent of breakdowns

    E Interpreting certification documentation in relation

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EVIDENCE GUIDE

to repair and replacement

F Following established breakdown procedures

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to attending to breakdowns in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of

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EVIDENCE GUIDE

explosion-protected equipment in a hazardous area

Competency unit in attending to breakdowns in general electrical or instrumentation equipment mechanical plant/equipment service and maintenance at least at AQF 3 or equivalent chosen as a prerequisite.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area and the Pressurisation (Ex 'p') explosion-protection technique:

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM023A Install explosion-protected equipment and wiring systems - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH150A - Assemble and set up basic security systems	
4	Update		Update recommended pre-requisite UEENEEI112A - Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF104A - Install and modify performance data communication copper cabling	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for installing explosion-protected and associated equipment and wiring systems. It requires the ability to match equipment with that specified for a given location, work safely, and to installation standards and complete the necessary installation documentation.

This unit is directly equivalent to the Unit *2.5 Install explosion-protected equipment and wiring systems* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for*

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Unit Descriptor **1**)

1.1) **Descriptor**

hazardous areas (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication installation job functions at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEH150A	Assemble and set up basic security systems
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF10	Install and modify performance data

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Prerequisite Unit(s) **2)**

4A communication copper cabling

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for installation of equipment and wiring.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Types of explosion-protected equipment and wiring systems to be installed are verified from design documents.
	1.3	Location in which specific items of equipment and circuits are to be installed is determined from design documents.
	1.4	Explosion-protected equipment markings are checked to ensure they conform to design specifications and certification documents.

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Certification document supplied with each item of equipment is collected for forwarding to appropriate personnel.
		1.6	Special tools, equipment and testing devices needed to carry out the installation work are obtained and checked for correct operation and safety.
2	Install the equipment and wiring systems	2.1	OHS policies and procedure for working in a hazardous area are followed.
		2.2	Equipment is installed to conform with design specifications and Standards and within the limits specified by the equipment certification.
		2.3	Equipment and wiring system components are dismantled where necessary and parts stored to protect them against loss or damage.
		2.4	Equipment and wiring are installed in a manner that does not reduce the type of protection afforded by the equipment design.
		2.5	Circuits are tested prior to connection to devices to ensure resistance of earthing is sufficiently low, installation resistance is safe and polarity and connections are correct and each circuit complies with requirements.
3	Confirm that the installation is completed.	3.1	Arrangements are made, in accordance with requirements, for an initial inspection to be carried out on the installation.
		3.2	Appropriate action is taken to rectify non-conformances found during the initial inspection to ensure the installation complies with requirements.
		3.3	The completed installation is documented in accordance with requirements and forwarded to personnel responsible for compiling the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing explosion protected equipment and wiring systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM023 A Explosion protection installation and maintenance requirements

Evidence shall show an understanding of explosion protection installation and maintenance requirements to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install explosion protected equipment and wiring systems as described in 8) and including:

    A Working safely in a potentially hazardous area including, the use of work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.

    B Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.

    C Checking equipment against certification documents including conditions of certification

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EVIDENCE GUIDE

relating to the safe use.

D Verifying equipment has been installed according to installation design specifications.

E Test installed cables/circuits to ensure they are safe.

F Documenting installation completion.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing explosion protected equipment and wiring systems.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent chosen as a prerequisite.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof (enclosures only) , (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')

Note: 'I' signifies Group I equipment

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM024A Install explosion-protected equipment and wiring systems - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH150A - Assemble and set up basic security systems	
4	Update		Update recommended pre-requisite UEENEEI112A - Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF104A - Install and modify performance data communication copper cabling	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for installing explosion-protected and associated equipment and wiring systems. It requires the ability to match equipment with that specified for a given location, work safely, and to installation standards and complete the necessary installation documentation.

This unit is directly equivalent to the Unit *2.5 Install explosion-protected equipment and wiring systems* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for*

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Unit Descriptor **1**)

1.1) **Descriptor**

hazardous areas (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication installation job functions at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEH150A	Assemble and set up basic security systems
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF10	Install and modify performance data

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Prerequisite Unit(s) **2)**

4A communication copper cabling

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for installation of equipment and wiring.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Types of explosion-protected equipment and wiring systems to be installed are verified from design documents.
	1.3	Location in which specific items of equipment and circuits are to be installed is determined from design documents.
	1.4	Explosion-protected equipment markings are checked to ensure they conform to design specifications and certification documents.
	1.5	Certification document supplied with each item

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ELEMENT		PERFORMANCE CRITERIA	
			of equipment is collected for forwarding to appropriate personnel.
		1.6	Special tools, equipment and testing devices needed to carry out the installation work are obtained and checked for correct operation and safety.
2	Install the equipment and wiring systems	2.1	OHS policies and procedure for working in a hazardous area are followed.
		2.2	Equipment is installed to conform with design specifications and Standards and within the limits specified by the equipment certification.
		2.3	Equipment and wiring system components are dismantled where necessary and parts stored to protect them against loss or damage.
		2.4	Equipment and wiring are installed in a manner that does not reduce the type of protection afforded by the equipment design.
		2.5	Circuits are tested prior to connection to devices to ensure resistance of earthing is sufficiently low, installation resistance is safe and polarity and connections are correct and each circuit complies with requirements.
3	Confirm that the installation is completed.	3.1	Arrangements are made, in accordance with requirements, for an initial inspection to be carried out on the installation.
		3.2	Appropriate action is taken to rectify non-conformances found during the initial inspection to ensure the installation complies with requirements.
		3.3	The completed installation is documented in accordance with requirements and forwarded to personnel responsible for compiling the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing explosion protected equipment and wiring systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM024 A Explosion protection installation and maintenance requirements

Evidence shall show an understanding of explosion protection installation and maintenance requirements to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install explosion protected equipment and wiring systems as described in 8) and including:

    A Working safely in a potentially hazardous area including, the use of work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.

    B Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.

    C Checking equipment against certification documents, including conditions of certification

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relating to the safe use, and design specifications.

D Verifying equipment has been installed according to installation design specifications.

E Test installed cables/circuits to ensure they are safe.

F Documenting installation completion.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing explosion protected equipment and wiring systems.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent chosen as a prerequisite.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM025A Install explosion-protected equipment and wiring systems - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH150A - Assemble and set up basic security systems	
4	Update		Update recommended pre-requisite UEENEEI112A - Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF104A - Install and modify performance data communication copper cabling	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for installing explosion-protected and associated equipment and wiring systems. It requires the ability to match equipment with that specified for a given location, work safely, and to installation standards and complete the necessary installation documentation.

This unit is directly equivalent to the Unit *2.5 Install explosion-protected equipment and wiring systems* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for*

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Unit Descriptor **1**)

1.1) **Descriptor**

hazardous areas (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication installation job functions at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG005B	Verify compliance and functionality of general electrical installations
UEENEEH050B	Assemble and set up basic wired and wireless security systems
UEENEEI012B	Verify compliance and functionality of process control installations
UEENEEF00	Install and modify performance data

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Prerequisite Unit(s)	**2)**	
	4B	communication structured cabling

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for installation of equipment and wiring.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Types of explosion-protected equipment and wiring systems to be installed are verified from design documents.
	1.3	Location in which specific items of equipment and circuits are to be installed is determined from design documents.
	1.4	Explosion-protected equipment markings are checked to ensure they conform to design specifications and certification documents.
	1.5	Certification document supplied with each item

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ELEMENT	PERFORMANCE CRITERIA	
		of equipment is collected for forwarding to appropriate personnel.
	1.6	Special tools, equipment and testing devices needed to carry out the installation work are obtained and checked for correct operation and safety.
2 Install the equipment and wiring systems	2.1	OHS policies and procedure for working in a hazardous area are followed.
	2.2	Equipment is installed to conform with design specifications and Standards and within the limits specified by the equipment certification.
	2.3	Equipment and wiring system components are dismantled where necessary and parts stored to protect them against loss or damage.
	2.4	Equipment and wiring are installed in a manner that does not reduce the type of protection afforded by the equipment design.
	2.5	Circuits are tested prior to connection to devices to ensure resistance of earthing is sufficiently low, installation resistance is safe and polarity and connections are correct and each circuit complies with requirements.
3 Confirm that the installation is completed.	3.1	Arrangements are made, in accordance with requirements, for an initial inspection to be carried out on the installation.
	3.2	Appropriate action is taken to rectify non-conformances found during the initial inspection to ensure the installation complies with requirements.
	3.3	The completed installation is documented in accordance with requirements and forwarded to personnel responsible for compiling the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing explosion protected equipment and wiring systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM02 Explosion protection installation and maintenance requirements 5A

Evidence shall show an understanding of explosion protection installation and maintenance requirements to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install explosion protected equipment and wiring systems as described in 8) and including:

    A Working safely in a potentially hazardous area including, the use of work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.

    B Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.

    C Checking equipment against certification documents including conditions of certification

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EVIDENCE GUIDE

relating to the safe use.

D Verifying equipment has been installed according to installation design specifications.

E Test installed cables/circuits to ensure they are safe.

F Documenting installation completion.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing explosion protected equipment and wiring systems.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent chosen as a prerequisite.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM026A Install explosion-protected equipment and wiring systems - pressurisation

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH150A - Assemble and set up basic security systems	
4	Update		Update recommended pre-requisite UEENEEI112A - Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF104A - Install and modify performance data communication copper cabling	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for installing explosion-protected and associated equipment and wiring systems. It requires the ability to match equipment with that specified for a given location, work safely, and to installation standards and complete the necessary installation documentation.

This unit is directly equivalent to the Unit *2.5 Install explosion-protected equipment and wiring systems* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for*

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Unit Descriptor **1**)

1.1) **Descriptor**

hazardous areas (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies electrical, instrumentation, electronics and data communication installation job functions at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEH150A	Assemble and set up basic security systems
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF10	Install and modify performance data

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Prerequisite Unit(s)	**2)**	
	4A	communication copper cabling

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for installation of equipment and wiring.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Types of explosion-protected equipment and wiring systems to be installed are verified from design documents.
	1.3	Location in which specific items of equipment and circuits are to be installed is determined from design documents.
	1.4	Explosion-protected equipment markings are checked to ensure they conform to design specifications and certification documents.
	1.5	Certification document supplied with each item

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ELEMENT		PERFORMANCE CRITERIA	
			of equipment is collected for forwarding to appropriate personnel.
		1.6	Special tools, equipment and testing devices needed to carry out the installation work are obtained and checked for correct operation and safety.
2	Install the equipment and wiring systems	2.1	OHS policies and procedure for working in a hazardous area are followed.
		2.2	Equipment is installed to conform with design specifications and Standards and within the limits specified by the equipment certification.
		2.3	Equipment and wiring system components are dismantled where necessary and parts stored to protect them against loss or damage.
		2.4	Equipment and wiring are installed in a manner that does not reduce the type of protection afforded by the equipment design.
		2.5	Circuits are tested prior to connection to devices to ensure resistance of earthing is sufficiently low, installation resistance is safe and polarity and connections are correct and each circuit complies with requirements.
3	Confirm that the installation is completed.	3.1	Arrangements are made, in accordance with requirements, for an initial inspection to be carried out on the installation.
		3.2	Appropriate action is taken to rectify non-conformances found during the initial inspection to ensure the installation complies with requirements.
		3.3	The completed installation is documented in accordance with requirements and forwarded to personnel responsible for compiling the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing explosion protected equipment and wiring systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM02 Explosion protection installation and maintenance requirements 6A

Evidence shall show an understanding of explosion protection installation and maintenance requirements to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install explosion protected equipment and wiring systems as described in 8) and including:

    A Working safely in a potentially hazardous area including, the use of work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.

    B Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.

    C Checking equipment against certification documents including conditions of certification

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EVIDENCE GUIDE

relating to the safe use.

D Verifying equipment has been installed according to installation design specifications.

E Test installed cables/circuits to ensure they are safe.

F Documenting installation completion.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing explosion protected equipment and wiring systems.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent chosen as a prerequisite.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This competency shall be demonstrated in relation to any classified hazardous area and pressurisation explosion-protection technique:

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM027A Maintain equipment in hazardous areas - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH118A Fault find and repair electronic apparatus	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF111A Test, report and rectify faults in data and voice installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for maintaining explosion-protected and associated equipment and wiring systems. It requires the ability to follow a maintenance program, work safely, carry out maintenance to Standards and manufacturer instructions and complete the necessary maintenance documentation.

This unit is directly equivalent to the Unit *2.7 Maintain equipment in hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas*

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Unit Descriptor **1**)

1.1) **Descriptor**

(*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication maintenance job functions at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in maintenance of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of general electrical installations
UEENEEH118A	Fault find and repair electronic apparatus
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF11	Test, report and rectify faults in data and

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Prerequisite Unit(s) **2)**

1A voice installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to carry out maintenance.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Area classification and details of explosion-protected equipment and wiring are ascertained from hazardous area layout drawings and equipment certification documents held in hazardous area verification dossier.
	1.3	Extent of maintenance to be conducted is established from the maintenance schedule and reports held in hazardous area verification dossier.
	1.4	Special tools, equipment and testing devices

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ELEMENT		PERFORMANCE CRITERIA	
			needed to carry out the maintenance work are obtained and checked for correct operation and safety.
2	Carry out maintenance.	2.1	OHS policies and procedures for working in a hazardous area are followed.
		2.2	Work is carried out to plan schedule to ensure all items are correctly maintained.
		2.3	Equipment is checked and tested in accordance with established procedures to determine whether it functions correctly, complies with approval documentation and is not subject to deterioration or damage.
		2.4	Equipment is adjusted or repaired within the limits permitted by the equipment certification and in accordance with manufacturer instructions.
		2.5	Certification documentation for replacement equipment is sighted to ensure that it is identical to the equipment it replaces and is in accordance with the explosion-protection system design.
		2.6	Circuits of equipment being withdrawn from service are terminated or isolated safely and in the manner approved for the classification of the area.
		2.7	Flexible cables and cords are examined and removed from service if they are not in immediate use or are found to be defective or damaged.
		2.8	Spare equipment, flexible cables and cords are maintained and suitably stored where they are not likely to suffer deterioration or damage.
3	Complete maintenance work inspections and documentation.	3.1	Detailed inspection of explosion-protected equipment and systems subject to the maintenance work is arranged in accordance with established procedures and requirements.
		3.2	Results of inspections and maintenance activities are recorded in accordance with established

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ELEMENT	PERFORMANCE CRITERIA	
		procedures and requirements.
	3.3	Appropriate personnel are notified of the completion of maintenance and details are documented in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining integrity of fixed gas detection equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM027 A Explosion protection installation and maintenance requirements

Evidence shall show an understanding of explosion protection installation and maintenance requirements to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain equipment in hazardous areas as described in 8) and including:

    A Working safely in a potentially hazardous area or confined space including the use of work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation.

    B Identifying defects and faults.

    C Interpreting certification documentation in relation to maintenance, repair and replacement.

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EVIDENCE GUIDE

D Following established maintenance procedures.

E Documenting maintenance details.

F Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining equipment in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of

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EVIDENCE GUIDE

explosion-protected equipment in a hazardous area

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent chosen as a prerequisite.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof (enclosures only) , (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')

Note: 'I' signifies Group I equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM028A Maintain equipment in hazardous areas - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH118A Fault find and repair electronic apparatus	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF111A Test, report and rectify faults in data and voice installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for maintaining explosion-protected and associated equipment and wiring systems. It requires the ability to follow a maintenance program, work safely, carry out maintenance to Standards and manufacturer instructions and complete the necessary maintenance documentation.

This unit is directly equivalent to the Unit *2.7 Maintain equipment in hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas*

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Unit Descriptor **1**)

1.1) **Descriptor**

(*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication maintenance job functions at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous areas

AND

Competencies in maintenance of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of general electrical installations
UEENEEH118A	Fault find and repair electronic apparatus
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF11	Test, report and rectify faults in data and

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Prerequisite Unit(s) **2)**

1A voice installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to carry out maintenance.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Area classification and details of explosion-protected equipment and wiring are ascertained from hazardous area layout drawings and equipment certification documents held in hazardous area verification dossier.
	1.3	Extent of maintenance to be conducted is established from the maintenance schedule and reports held in hazardous area verification dossier.
	1.4	Special tools, equipment and testing devices needed to carry out the maintenance work are

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ELEMENT	PERFORMANCE CRITERIA	
		obtained and checked for correct operation and safety.
2 Carry out maintenance.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Work is carried out to plan schedule to ensure all items are correctly maintained.
	2.3	Equipment is checked and tested in accordance with established procedures to determine whether it functions correctly, complies with approval documentation and is not subject to deterioration or damage.
	2.4	Equipment is adjusted or repaired within the limits permitted by the equipment certification and in accordance with manufacturer instructions.
	2.5	Certification documentation for replacement equipment is sighted to ensure that it is identical to the equipment it replaces and is in accordance with the explosion-protection system design.
	2.6	Circuits of equipment being withdrawn from service are terminated or isolated safely and in the manner approved for the classification of the area.
	2.7	Flexible cables and cords are examined and removed from service if they are not in immediate use or are found to be defective or damaged.
	2.8	Spare equipment, flexible cables and cords are maintained and suitably stored where they are not likely to suffer deterioration or damage.
3 Complete maintenance work inspections and documentation.	3.1	Detailed inspection of explosion-protected equipment and systems subject to the maintenance work is arranged in accordance with established procedures and requirements.
	3.2	Results of inspections and maintenance activities are recorded in accordance with established procedures and requirements.

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ELEMENT	PERFORMANCE CRITERIA
	3.3 Appropriate personnel are notified of the completion of maintenance and details are documented in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining integrity of fixed gas detection equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM028 A Explosion protection installation and maintenance requirements

Evidence shall show an understanding of explosion protection installation and maintenance requirements to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain equipment in hazardous areas as described in 8) and including:

    A Working safely in a potentially hazardous area or confined space including the use of work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation

    B Identifying defects and faults.

    C Interpreting certification documentation in relation to maintenance, repair and replacement

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EVIDENCE GUIDE

D Following established maintenance procedures.

E Documenting maintenance details.

F Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining equipment in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of

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EVIDENCE GUIDE

explosion-protected equipment in a hazardous area

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent chosen as a prerequisite.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5)**

Hazards

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UEENEEM029A Maintain equipment in hazardous areas - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH118A Fault find and repair electronic apparatus	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF111A Test, report and rectify faults in data and voice installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for maintaining explosion-protected and associated equipment and wiring systems. It requires the ability to follow a maintenance program, work safely, carry out maintenance to Standards and manufacturer instructions and complete the necessary maintenance documentation.

This unit is directly equivalent to the Unit *2.7 Maintain equipment in hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas*

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Unit Descriptor **1**)

1.1) **Descriptor**

(*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication maintenance job functions at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in maintenance of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of general electrical installations

OR

UEENEEH118A	Fault find and repair electronic apparatus
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations

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Prerequisite Unit(s) **2)**

UEENEEF111A	Test, report and rectify faults in data and voice installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to carry out maintenance.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Area classification and details of explosion-protected equipment and wiring are ascertained from hazardous area layout drawings and equipment certification documents held in hazardous area verification dossier.
	1.3	Extent of maintenance to be conducted is established from the maintenance schedule and reports held in hazardous area verification dossier.

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ELEMENT	PERFORMANCE CRITERIA	
	1.4	Special tools, equipment and testing devices needed to carry out the maintenance work are obtained and checked for correct operation and safety.
2 Carry out maintenance.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Work is carried out to plan schedule to ensure all items are correctly maintained.
	2.3	Equipment is checked and tested in accordance with established procedures to determine whether it functions correctly, complies with approval documentation and is not subject to deterioration or damage.
	2.4	Equipment is adjusted or repaired within the limits permitted by the equipment certification and in accordance with manufacturer instructions.
	2.5	Certification documentation for replacement equipment is sighted to ensure that it is identical to the equipment it replaces and is in accordance with the explosion-protection system design.
	2.6	Circuits of equipment being withdrawn from service are terminated or isolated safely and in the manner approved for the classification of the area.
	2.7	Flexible cables and cords are examined and removed from service if they are not in immediate use or are found to be defective or damaged.
	2.8	Spare equipment, flexible cables and cords are maintained and suitably stored where they are not likely to suffer deterioration or damage.
3 Complete maintenance work inspections and documentation.	3.1	Detailed inspection of explosion-protected equipment and systems subject to the maintenance work is arranged in accordance with established procedures and requirements.
	3.2	Results of inspections and maintenance activities

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ELEMENT	PERFORMANCE CRITERIA	
		are recorded in accordance with established procedures and requirements.
	3.3	Appropriate personnel are notified of the completion of maintenance and details are documented in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining integrity of fixed gas detection equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM029 Explosion protection installation and maintenance requirements A

Evidence shall show an understanding of explosion protection installation and maintenance requirements to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain equipment in hazardous areas as described in 8) and including:

    A Working safely in a potentially hazardous area or confined space including the use of work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation

    B Identifying defects and faults.

    C Interpreting certification documentation in relation to maintenance, repair and replacement

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D Following established maintenance procedures.

E Documenting maintenance details.

F Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining equipment in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of

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explosion-protected equipment in a hazardous area

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent chosen as a prerequisite.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM030A Maintain equipment in hazardous areas - pressurisation

Modification History

4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH118A Fault find and repair electronic apparatus	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF111A Test, report and rectify faults in data and voice installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for maintaining explosion-protected and associated equipment and wiring systems. It requires the ability to follow a maintenance program, work safely, carry out maintenance to Standards and manufacturer instructions and complete the necessary maintenance documentation.

This unit is directly equivalent to the Unit *2.7 Maintain equipment in hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication maintenance job functions at AQF 3 or higher. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of

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Prerequisite Unit(s)

2)

the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in maintenance of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of general electrical installations

OR

UEENEEH118A	Fault find and repair electronic apparatus
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF111A	Test, report and rectify faults in data and voice installations

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to carry out maintenance.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Area classification and details of explosion-protected equipment and wiring are ascertained from hazardous area layout drawings and equipment certification documents held in hazardous area verification dossier.
	1.3	Extent of maintenance to be conducted is established from the maintenance schedule and reports held in hazardous area verification dossier.
	1.4	Special tools, equipment and testing devices needed to carry out the maintenance work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Carry out maintenance.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Work is carried out to plan schedule to ensure all items are correctly maintained.
	2.3	Equipment is checked and tested in accordance with established procedures to determine whether it functions correctly, complies with approval documentation and is not subject to deterioration or damage.
	2.4	Equipment is adjusted or repaired within the limits permitted by the equipment certification and in accordance with manufacturer instructions.
	2.5	Certification documentation for replacement equipment is sighted to ensure that it is identical to the equipment it replaces and is in accordance with the explosion-protection system design.
	2.6	Circuits of equipment being withdrawn from service are terminated or isolated safely and in the manner approved for the classification of the area.
	2.7	Flexible cables and cords are examined and removed from service if they are not in immediate use or are found to be defective or damaged.
	2.8	Spare equipment, flexible cables and cords are maintained and suitably stored where they are not likely to suffer deterioration or damage.
3 Complete maintenance work inspections and documentation.	3.1	Detailed inspection of explosion-protected equipment and systems subject to the maintenance work is arranged in accordance with established procedures and requirements.
	3.2	Results of inspections and maintenance activities are recorded in accordance with established procedures and requirements.
	3.3	Appropriate personnel are notified of the completion of maintenance and details are

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ELEMENT	PERFORMANCE CRITERIA
	documented in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining integrity of fixed gas detection equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM030A Explosion protection installation and maintenance requirements

Evidence shall show an understanding of explosion protection installation and maintenance requirements to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).

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REQUIRED SKILLS AND KNOWLEDGE

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation

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REQUIRED SKILLS AND KNOWLEDGE

of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and

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REQUIRED SKILLS AND KNOWLEDGE

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain equipment in hazardous areas as described in 8) and including:

    A Working safely in a potentially hazardous area or confined space including the use of work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation

    B Identifying defects and faults.

    C Interpreting certification documentation in relation to maintenance, repair and replacement

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EVIDENCE GUIDE

D Following established maintenance procedures.

E Documenting maintenance details.

F Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining equipment in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of

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EVIDENCE GUIDE

explosion-protected equipment in a hazardous area

Competencies in installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems at AQF 3 or equivalent chosen as a prerequisite.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area and the Pressurisation (Ex 'p') explosion-protection technique.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM031A Overhaul and repair of explosion-protected equipment - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEG160A – Evaluate performance of LV electrical machines	
4	Update		Update pre-requisite MEM15020C – Perform verification/certification or in-service inspection	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment and the activities required of the responsible person. It requires the ability to establish and document the level of work required, arranging for the overhaul/repair to be carried, verify compliance of overhauled/repaired equipment and complete the necessary documentation.

This unit is directly equivalent to the Unit 2.8 *Overhaul and repair of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments formally-acquired competencies applying to electrical, electronic, and/or mechanical equipment repair workshop supervisory job function. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place for equipment that is disconnected from electrical supply. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEG160A	Evaluate performance of LV electrical machines
MEM15020C	Perform verification/certification or in-service inspection

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Employability Skills Information

Employability Skills	**3**)
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for overhaul/repair of equipment.	1.1	Instructions on overhaul and/or repair are received and expected outcomes of the work confirmed with appropriate personnel.
	1.2	Certification documents for the equipment are sought and received in order to check that the equipment complies with the certification.
2 Establish the level of overhaul required.	2.1	Measurements, tests and inspections are carried out on the equipment in accordance with OHS and other established procedures.
	2.2	The extent of work to be done is determined from measurement, test and inspection results and their correspondence with original certification and the requirements of Standards.
	2.3	Specifications and instructions for the overhaul/repair work are documented in

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ELEMENT		PERFORMANCE CRITERIA	
			accordance with requirements.
3	Arrange overhaul/repair work.	3.1	Arrangements are made for the overhaul/repair work to be done in accordance with established procedures.
		3.2	A copy of overhaul/repair specifications and instructions is provided to personnel responsible for carrying out the work.
4	Verify that equipment complies with original certification.	4.1	Level of testing required to verify that overhauled/repaired equipment complies with original certification specifications is determined in accordance with requirements.
		4.2	Verification tests are conducted in accordance with established procedures.
5	Document overhaul/repair work.	5.1	Equipment marking is checked and marked where applicable, in accordance with original certification.
		5.2	Overhaul/repair work is documented in accordance with requirements stating that the equipment complies with the original certification.
		5.3	Documentation of the repair work is retained and a copy is issued with the equipment for inclusion in the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and overhauling and repairing explosion protected equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM031 A Explosion-protection equipment overhaul and repair

Evidence shall show an understanding of explosion-protection equipment overhaul and repair to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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REQUIRED SKILLS AND KNOWLEDGE

protected by the Intrinsic safety (Ex 'i') technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex 'p') explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex 'p') technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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REQUIRED SKILLS AND KNOWLEDGE

techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 The scope and limitations for overhaul and repair of explosion-protected equipment encompassing:

- the requirements for registration of a workshop;
- the requirements of a ‘competent person’ for a registered workshop engaged in the overhaul/repair of explosion-protected equipment; and
- the scope and limitations of work permitted under workshop registration.

T15 Overhaul and repair (technical) Standard encompassing:

- the documentation/information required to enable overhaul/repair to be undertaken;
- categories of work, for example, overhaul; no repair; overhaul-repair;
- modifications that are, and are not, permitted within the equipment certification; and
- the requirements for overhaul/repair processes relevant to the type of protection and equipment.

T16 Requirements for documentation and identification of overhauled/repaired explosion-protected encompassing:

- overhaul/repair report document; and
- requirements for distribution of overhaul/repair reports.

T17 Quality management systems as covered by international Standards encompassing:

- documentation regime of a quality management system;
- principle of document and data control covering both internally and externally generated documents and data; and
- principles of process control as applied to the overhaul and repair of explosion-protected equipment.

T18 The level of overhaul/repair required encompassing:

- Standards and their use for determining the requirement for a specific explosion-protection technique;
- measurement/tests and equipment required to determine whether an item of equipment meets the certification requirements;
- requirements for maintaining the accuracy/calibration of measuring/test equipment;

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REQUIRED SKILLS AND KNOWLEDGE

- measurement/test procedures for determining whether an item of equipment meets the certification requirements;
- level of overhaul/repair required from comparisons of test results and requirements specified in the original certification; and
- specifying overhaul/repair work required to restore an item of explosion-protected equipment to conform with the original certification.

T19 Measurement/tests procedures to verify that an item of equipment meets the original certification requirements

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Overhaul and repair explosion-protected equipment as described in 8) and including:

    A Following OHS procedures.

    B Interpreting certification documentation and Standards.

    C Measuring, testing and inspecting equipment for compliance with certification and Standards.

    D Specifying overhaul/repair work.

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EVIDENCE GUIDE

E Documenting overhaul/repair work.

F Using quality systems.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to overhauling and repairing explosion protected equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with competence in the overhaul and repair of general low-voltage or extra-low-voltage equipment.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')

Note: 'I' signifies Group I equipment

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM032A Overhaul and repair of explosion-protected equipment - flameproof enclosures

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEG160A – Evaluate performance of LV electrical machines	
4	Update		Update pre-requisite MEM15020C – Perform verification/certification or in-service inspection	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment and the activities required of the responsible person. It requires the ability to establish and document the level of work required, arranging for the overhaul/repair to be carried, verify compliance of overhauled/repaired equipment and complete the necessary documentation.

This unit is directly equivalent to the Unit 2.8 *Overhaul and repair of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments formally-acquired competencies applying to electrical, electronic, and/or mechanical equipment repair workshop supervisory job function. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place for equipment that is disconnected from electrical supply. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competency in overhaul and repair of general low-voltage or extra-low voltage electrical/electronic equipment at AQF 3 or equivalent. Example are (but not limited to):

UEENEEG 160A	Evaluate performance of LV electrical machines
MEM15020 C	Perform verification/certification or in-service inspection

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Employability Skills Information

Employability Skills	**3**)
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for overhaul/repair of equipment.	1.1	Instructions on overhaul and/or repair are received and expected outcomes of the work confirmed with appropriate personnel.
	1.2	Certification documents for the equipment are sought and received in order to check that the equipment complies with the certification.
2 Establish the level of overhaul required.	2.1	Measurements, tests and inspections are carried out on the equipment in accordance with OHS and other established procedures.
	2.2	The extent of work to be done is determined from measurement, test and inspection results and their correspondence with original certification and the requirements of Standards.
	2.3	Specifications and instructions for the overhaul/repair work are documented in accordance with requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Arrange overhaul/repair work.	3.1	Arrangements are made for the overhaul/repair work to be done in accordance with established procedures.
	3.2	A copy of overhaul/repair specifications and instructions is provided to personnel responsible for carrying out the work.
4 Verify that equipment complies with original certification.	4.1	Level of testing required to verify that overhauled/repaired equipment complies with original certification specifications is determined in accordance with requirements.
	4.2	Verification tests are conducted in accordance with established procedures.
5 Document overhaul/repair work.	5.1	Equipment marking is checked and marked where applicable, in accordance with original certification.
	5.2	Overhaul/repair work is documented in accordance with requirements stating that the equipment complies with the original certification.
	5.3	Documentation of the repair work is retained and a copy is issued with the equipment for inclusion in the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and overhauling and repairing explosion protected equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM03 Explosion-protection equipment overhaul and repair 2A

Evidence shall show an understanding of explosion-protection equipment overhaul and repair to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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REQUIRED SKILLS AND KNOWLEDGE

protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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REQUIRED SKILLS AND KNOWLEDGE

techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 The scope and limitations for overhaul and repair of explosion-protected equipment encompassing:

- the requirements for registration of a workshop;
- the requirements of a ‘competent person’ for a registered workshop engaged in the overhaul/repair of explosion-protected equipment; and
- the scope and limitations of work permitted under workshop registration.

T15 Overhaul and repair (technical) Standard encompassing:

- the documentation/information required to enable overhaul/repair to be undertaken;
- categories of work, for example, overhaul; no repair; overhaul-repair;
- modifications that are, and are not, permitted within the equipment certification; and
- the requirements for overhaul/repair processes relevant to the type of protection and equipment.

T16 Requirements for documentation and identification of overhauled/repaired explosion-protected encompassing:

- overhaul/repair report document; and
- requirements for distribution of overhaul/repair reports.

T17 Quality management systems as covered by international Standards encompassing:

documentation regime of a quality management system;

principle of document and data control covering both internally and externally generated documents and data; and

principles of process control as applied to the overhaul and repair of explosion-protected equipment.

T18 The level of overhaul/repair required encompassing:

- Standards and their use for determining the requirement for a specific explosion-protection technique;
- measurement/tests and equipment required to determine whether an item of equipment meets the certification requirements;
- requirements for maintaining the accuracy/calibration of measuring/test equipment;

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- measurement/test procedures for determining whether an item of equipment meets the certification requirements;
- level of overhaul/repair required from comparisons of test results and requirements specified in the original certification; and
- specifying overhaul/repair work required to restore an item of explosion-protected equipment to conform with the original certification.

T19 Measurement/tests procedures to verify that an item of equipment meets the original certification requirements

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Overhaul and repair explosion-protected equipment as described in 8) and including:

    A Following OHS procedures.

    B Interpreting certification documentation and Standards.

    C Measuring, testing and inspecting equipment for compliance with certification and Standards.

    D Specifying overhaul/repair work.

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EVIDENCE GUIDE

E Documenting overhaul/repair work.

F Using quality systems.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to overhauling and repairing explosion protected equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competence in the overhaul and repair of general low-voltage or extra-low-voltage electrical/electronic equipment.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to overhaul of flameproof (Ex 'dI') explosion-protected enclosures only.

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM033A Overhaul and repair of explosion-protected equipment - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEG160A – Evaluate performance of LV electrical machines	
4	Update		Update pre-requisite MEM15020C – Perform verification/certification or in-service inspection	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment and the activities required of the responsible person. It requires the ability to establish and document the level of work required, arranging for the overhaul/repair to be carried, verify compliance of overhauled/repaired equipment and complete the necessary documentation.

This unit is directly equivalent to the Unit 2.8 *Overhaul and repair of explosion-protected equipment* in the Australian/New Zealand Standard *AS*/*NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments formally-acquired competencies applying to electrical, electronic, and/or mechanical equipment repair workshop supervisory job function. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place for equipment that is disconnected from electrical supply. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competency in overhaul and repair of general low-voltage or extra-low voltage electrical/electronic equipment at AQF 3 or equivalent. Example are (but not limited to):

UEENEEG 160A	Evaluate performance of LV electrical machines
MEM15020 C	Perform verification/certification or in-service inspection

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Employability Skills Information

Employability Skills	**3**)
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for overhaul/repair of equipment.	1.1	Instructions on overhaul and/or repair are received and expected outcomes of the work confirmed with appropriate personnel.
	1.2	Certification documents for the equipment are sought and received in order to check that the equipment complies with the certification.
2 Establish the level of overhaul required.	2.1	Measurements, tests and inspections are carried out on the equipment in accordance with OHS and other established procedures.
	2.2	The extent of work to be done is determined from measurement, test and inspection results and their correspondence with original certification and the requirements of Standards.
	2.3	Specifications and instructions for the overhaul/repair work are documented in accordance with requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Arrange overhaul/repair work.	3.1	Arrangements are made for the overhaul/repair work to be done in accordance with established procedures.
	3.2	A copy of overhaul/repair specifications and instructions is provided to personnel responsible for carrying out the work.
4 Verify that equipment complies with original certification.	4.1	Level of testing required to verify that overhauled/repaired equipment complies with original certification specifications is determined in accordance with requirements.
	4.2	Verification tests are conducted in accordance with established procedures.
5 Document overhaul/repair work.	5.1	Equipment marking is checked and marked where applicable, in accordance with original certification.
	5.2	Overhaul/repair work is documented in accordance with requirements stating that the equipment complies with the original certification.
	5.3	Documentation of the repair work is retained and a copy is issued with the equipment for inclusion in the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and overhauling and repairing explosion protected equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM033 A Explosion-protection equipment overhaul and repair

Evidence shall show an understanding of explosion-protection equipment overhaul and repair to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 The scope and limitations for overhaul and repair of explosion-protected equipment encompassing:

- the requirements for registration of a workshop;
- the requirements of a ‘competent person’ for a registered workshop engaged in the overhaul/repair of explosion-protected equipment; and
- the scope and limitations of work permitted under workshop registration.

T15 Overhaul and repair (technical) Standard encompassing:

- the documentation/information required to enable overhaul/repair to be undertaken;
- categories of work, for example, overhaul; no repair; overhaul-repair;
- modifications that are, and are not, permitted within the equipment certification; and
- the requirements for overhaul/repair processes relevant to the type of protection and equipment.

T16 Requirements for documentation and identification of overhauled/repaired explosion-protected encompassing:

- overhaul/repair report document; and
- requirements for distribution of overhaul/repair reports.

T17 Quality management systems as covered by international Standards encompassing:

- documentation regime of a quality management system;
- principle of document and data control covering both internally and externally generated documents and data; and
- principles of process control as applied to the overhaul and repair of explosion-protected equipment.

T18 The level of overhaul/repair required encompassing:

- Standards and their use for determining the requirement for a specific explosion-protection technique;
- measurement/tests and equipment required to determine whether an item of equipment meets the certification requirements;
- requirements for maintaining the accuracy/calibration of measuring/test equipment;

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REQUIRED SKILLS AND KNOWLEDGE

- measurement/test procedures for determining whether an item of equipment meets the certification requirements;
- level of overhaul/repair required from comparisons of test results and requirements specified in the original certification; and
- specifying overhaul/repair work required to restore an item of explosion-protected equipment to conform with the original certification.

T19 Measurement/tests procedures to verify that an item of equipment meets the original certification requirements

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Overhaul and repair explosion-protected equipment as described in 8) and including:

    A Following OHS procedures.

    B Interpreting certification documentation and Standards.

    C Measuring, testing and inspecting equipment for compliance with certification and Standards.

    D Specifying overhaul/repair work.

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EVIDENCE GUIDE

E Documenting overhaul/repair work.

F Using quality systems.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to overhauling and repairing explosion protected equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competence in the overhaul and repair of general low-voltage or extra-low-voltage.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to overhaul of equipment incorporating all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')
- Pressurisation (Ex 'p')

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM034A Overhaul and repair of explosion-protected equipment - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEG160A – Evaluate performance of LV electrical machines	
4	Update		Update pre-requisite MEM15020C – Perform verification/certification or in-service inspection	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment and the activities required of the responsible person. It requires the ability to establish and document the level of work required, arranging for the overhaul/repair to be carried, verify compliance of overhauled/repaired equipment and complete the necessary documentation.

This unit is directly equivalent to the Unit 2.8 *Overhaul and repair of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments formally-acquired competencies applying to electrical, electronic, and/or mechanical equipment repair workshop supervisory job function. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place for equipment that is disconnected from electrical supply. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competency in overhaul and repair of general low-voltage or extra-low voltage electrical/electronic equipment at AQF 3 or equivalent. Example are (but not limited to):

UEENEEG 160A	Evaluate performance of LV electrical machines
MEM15020 C	Perform verification/certification or in-service inspection

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Employability Skills Information

Employability Skills	**3**)
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for overhaul/repair of equipment.	1.1	Instructions on overhaul and/or repair are received and expected outcomes of the work confirmed with appropriate personnel.
	1.2	Certification documents for the equipment are sought and received in order to check that the equipment complies with the certification.
2 Establish the level of overhaul required.	2.1	Measurements, tests and inspections are carried out on the equipment in accordance with OHS and other established procedures.
	2.2	The extent of work to be done is determined from measurement, test and inspection results and their correspondence with original certification and the requirements of Standards.
	2.3	Specifications and instructions for the overhaul/repair work are documented in accordance with requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Arrange overhaul/repair work.	3.1	Arrangements are made for the overhaul/repair work to be done in accordance with established procedures.
	3.2	A copy of overhaul/repair specifications and instructions is provided to personnel responsible for carrying out the work.
4 Verify that equipment complies with original certification.	4.1	Level of testing required to verify that overhauled/repaired equipment complies with original certification specifications is determined in accordance with requirements.
	4.2	Verification tests are conducted in accordance with established procedures.
5 Document overhaul/repair work.	5.1	Equipment marking is checked and marked where applicable, in accordance with original certification.
	5.2	Overhaul/repair work is documented in accordance with requirements stating that the equipment complies with the original certification.
	5.3	Documentation of the repair work is retained and a copy is issued with the equipment for inclusion in the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and overhauling and repairing explosion protected equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM034 A Explosion-protection equipment overhaul and repair

Evidence shall show an understanding of explosion-protection equipment overhaul and repair to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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REQUIRED SKILLS AND KNOWLEDGE

techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 The scope and limitations for overhaul and repair of explosion-protected equipment encompassing:

- the requirements for registration of a workshop;
- the requirements of a ‘competent person’ for a registered workshop engaged in the overhaul/repair of explosion-protected equipment; and
- the scope and limitations of work permitted under workshop registration.

T15 Overhaul and repair (technical) Standard encompassing:

- the documentation/information required to enable overhaul/repair to be undertaken;
- categories of work, for example, overhaul; no repair; overhaul-repair;
- modifications that are, and are not, permitted within the equipment certification; and
- the requirements for overhaul/repair processes relevant to the type of protection and equipment.

T16 Requirements for documentation and identification of overhauled/repaired explosion-protected encompassing:

- overhaul/repair report document; and
- requirements for distribution of overhaul/repair reports.

T17 Quality management systems as covered by international Standards encompassing:

- documentation regime of a quality management system;
- principle of document and data control covering both internally and externally generated documents and data; and
- principles of process control as applied to the overhaul and repair of explosion-protected equipment.

T18 The level of overhaul/repair required encompassing:

- Standards and their use for determining the requirement for a specific explosion-protection technique;
- measurement/tests and equipment required to determine whether an item of equipment meets the certification requirements;
- requirements for maintaining the accuracy/calibration of measuring/test equipment;

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- measurement/test procedures for determining whether an item of equipment meets the certification requirements;
- level of overhaul/repair required from comparisons of test results and requirements specified in the original certification; and
- specifying overhaul/repair work required to restore an item of explosion-protected equipment to conform with the original certification.

T19 Measurement/tests procedures to verify that an item of equipment meets the original certification requirements

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Overhaul and repair explosion-protected equipment as described in 8) and including:

    A Following OHS procedures.

    B Interpreting certification documentation and Standards.

    C Measuring, testing and inspecting equipment for compliance with certification and Standards.

    D Specifying overhaul/repair work.

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EVIDENCE GUIDE

E Documenting overhaul/repair work.

F Using quality systems.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to overhauling and repairing explosion protected equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competence in the overhaul and repair of general low-voltage or extra-low-voltage.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to overhaul of equipment incorporating all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM035A Conduct a conformity assessment of explosion-protected equipment - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE084A – Write specifications for electrotechnology engineering projects	
4	Update		Update pre-requisite UEENEEE124A – Compile and produce an energy sector detailed report	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers assessing the Certification documentation of explosion-protected equipment with a certificate of conformity other than an IEC Ex, ANZ Ex or AUS Ex Certificate, and producing a conformity assessment document. It encompasses skills and knowledge to examine and compare document content, compare requirements of IEC or AS/NZS Standards with alternative Standards on which the original certification was based, knowledge of explosion-protection techniques and technical report writing.

This unit is directly equivalent to the Unit *2.9 Conduct a conformity assessment of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Note
This unit is for the preparation of a conformity assessment

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Unit Descriptor **1**)

1.1) **Descriptor**

document, including Standards to alternative Standards assessment only.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering job functions, which involve design and selection of explosion-protected electrical equipment..

Note:
Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing at AQF 5 or equivalent. Example are (but not limited to):

UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects
UEENEEE015B	Develop design briefs for electrotechnology projects
UEENEEE084A	Write specifications for electrotechnology engineering projects
UEENEEE124A	Compile and produce an energy sector detailed report

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct conformity assessment.	1.1	Certification documentation is obtained and read to determine the certification specifications for which the equipment has been assessed.
	1.2	Relevant Standards required to begin the conformity assessment are obtained in accordance with established procedures. .
	1.3	OHS policies and procedures are followed where a site inspection is required to identify equipment subject to the conformity assessment that is already installed. NOTE: The conformity assessment document process is essentially a desktop process.
2 Conduct conformity assessment.	2.1	Conformity assessment is carried out in accordance with OHS and other established procedures.
	2.2	Knowledge of IEC or AS/NZS Standards is applied to a detailed comparison with alternative

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ELEMENT	PERFORMANCE CRITERIA	
		Standards on which original certification is based.
	2.3	The documented certification criteria of the equipment are compared to those required by currently acceptable Standards, including any test on which the certification is based. NOTE: The conformity assessment document will provide, in addition to the direct product evaluation, any information that is relevant to its use, e.g. installation, maintenance, overhaul/repair and conditions of use.
	2.4	Discrepancies between the certification documentation and IEC or AS/NZS Standards are identified and actions needed to correctly address each of these are recorded.
3 Document and submit conformity assessment report. .	3.1	Conformity assessment results are documented in a conformity assessment document, which informs whether the equipment provides an 'equivalent level of safety' to be installed, maintained, overhauled/repaired and used safely in a hazardous area.
	3.2	Recommendations for corrective actions to address discrepancies are included in the conformity assessment document.
	3.3	Conformity assessment document is forwarded to appropriate personnel in accordance with established procedures for inclusion in the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assessing explosion protected equipment for compliance with Standards.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM035 A Explosion-protected equipment conformity assessment

Evidence shall show an understanding of explosion-protected equipment conformity assessment to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex 'i') technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex 'p') explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex 'p') technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 The compliance certification and the ‘Ex’ scheme for recognition of certification encompassing:

- the purposes of certification of explosion-protected equipment;
- the parties involved in the assessment/testing and certification of explosion-protected equipment and their responsibilities; and
- the process for recognition of assessment/testing and certification of explosion-protected equipment from other countries.

T15 The preparation required to assess explosion-protected equipment for compliance with Standards encompassing:

- the special safety measures that should be taken when assessing/testing explosion-protected equipment;
- documentation required prior to conducting conformity assessment;
- tests necessary to establish that an item of explosion-protected equipment conforms with relevant Standards; and
- situations where testing is not applicable or required.

T16 Assessing and testing explosion-protected equipment encompassing:

- assessment and test requirements; and.
- procedures for conducting a conformity assessment.

T17 Documentation used in assessing explosion-protected equipment for conformance to accepted Standards encompassing:

- The documentation and Standard(s) required to begin an assessment.
- The differences between the test requirements of Standards from other countries and the compliant/acceptable Standards against which the equipment is being assessed.
- Results given in equipment test reports.
- Conformity assessment processes and procedures.

T18 Assessing to a current acceptable Standard existing equipment that has been certified to previously acceptable Standards encompassing:

- processes and procedures used; and
- possible outcomes.

T19 A clause by clause assessment between the equipment manufacturing

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REQUIRED SKILLS AND KNOWLEDGE

Standard(s) and the current acceptable Ex Standards encompassing:

- processes and procedures used; and
- differences between the Standards that may be detected.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assess explosion protected equipment for compliance with Standards as described in 8) and including:

    A Following OHS procedures

    B Determining the certification specification of the equipment to be assessed.

    C Obtaining and understanding the relevant Standards to be used, including various national and international Standards

    D Accurately comparing documented certification criteria with the requirements of the various

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EVIDENCE GUIDE

certification schemes.

E Identifying discrepancies relating to the certification documentation used.

F Making appropriate recommendations of actions to correctly address discrepancies.

G Producing a conformity assessment document that clearly informs whether the equipment provides an 'equivalent level of safety' to be installed, maintained, overhauled/repaired and used safely in a hazardous area.

H Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assessing explosion protected equipment for compliance with Standards.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')

Note 'I' signifies Group I equipment

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM036A Conduct a conformity assessment of explosion-protected equipment - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE084A – Write specifications for electrotechnology engineering projects	
4	Update		Update pre-requisite UEENEEE124A – Compile and produce an energy sector detailed report	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers assessing the Certification documentation of explosion-protected equipment with a certificate of conformity other than an IECEx, ANZEx or AUS Ex Certificate, and producing a conformity assessment document. It encompasses skills and knowledge to examine and compare document content, compare requirements of IEC or AS/NZS Standards with alternative Standards on which the original certification was based, knowledge of explosion-protection techniques and technical report writing.

This unit is directly equivalent to the Unit *2.9 Conduct a conformity assessment of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Note
This unit is for the preparation of a conformity assessment

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Unit Descriptor **1**)

1.1) Descriptor

document, including Standards to alternative Standards assessment only.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering job functions, which involve design and selection of explosion-protected electrical equipment.

Note:
Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing at AQF 5 or equivalent. Example are (but not limited to):

UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects
UEENEEE015B	Develop design briefs for electrotechnology projects
UEENEEE084A	Write specifications for electrotechnology engineering projects
UEENEEE124A	Compile and produce an energy sector detailed report

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct conformity assessment.	1.1	Certification documentation is obtained and read to determine the certification specifications for which the equipment has been assessed.
	1.2	Relevant Standards required to begin the conformity assessment are obtained in accordance with established procedures.
	1.3	OHS policies and procedures are followed where a site inspection is required to identify equipment subject to the conformity assessment that is already installed. NOTE: The conformity assessment document process is essentially a desktop process.
2 Conduct conformity assessment.	2.1	Conformity assessment is carried out in accordance with OHS and other established procedures.
	2.2	Knowledge of IEC or AS/NZS Standards is applied to a detailed comparison with alternative Standards on which original certification is

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ELEMENT	PERFORMANCE CRITERIA	
		based.
	2.3	The documented certification criteria of the equipment are compared to those required by currently acceptable Standards, including any test on which the certification is based. NOTE: The conformity assessment document will provide, in addition to the direct product evaluation, any information that is relevant to its use, e.g. installation, maintenance, overhaul/repair and conditions of use.
	2.4	Discrepancies between the certification documentation and IEC or AS/NZS Standards are identified and actions needed to correctly address each of these are recorded.
3 Document and submit conformity assessment report. .	3.1	Conformity assessment results are documented in a conformity assessment document, which informs whether the equipment provides an 'equivalent level of safety' to be installed, maintained, overhauled/repaired and used safely in a hazardous area.
	3.2	Recommendations for corrective actions to address discrepancies are included in the conformity assessment document.
	3.3	Conformity assessment document is forwarded to appropriate personnel in accordance with established procedures for inclusion in the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assessing explosion protected equipment for compliance with Standards.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM036 A Explosion-protected equipment conformity assessment

Evidence shall show an understanding of explosion-protected equipment conformity assessment to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 The compliance certification and the ‘Ex’ scheme for recognition of certification encompassing:

- the purposes of certification of explosion-protected equipment;
- the parties involved in the assessment/testing and certification of explosion-protected equipment and their responsibilities; and
- the process for recognition of assessment/testing and certification of explosion-protected equipment from other countries.

T15 The preparation required to assess explosion-protected equipment for compliance with Standards encompassing:

- the special safety measures that should be taken when assessing/testing explosion-protected equipment;
- documentation required prior to conducting conformity assessment;
- tests necessary to establish that an item of explosion-protected equipment conforms with relevant Standards; and
- situations where testing is not applicable or required.

T16 Assessing and testing explosion-protected equipment encompassing:

- assessment and test requirements; and.
- procedures for conducting a conformity assessment.

T17 Documentation used in assessing explosion-protected equipment for conformance to accepted Standards encompassing:

- The documentation and Standard(s) required to begin an assessment.
- The differences between the test requirements of Standards from other countries and the compliant/acceptable Standards against which the equipment is being assessed.
- Results given in equipment test reports.
- Conformity assessment processes and procedures.

T18 Assessing to a current acceptable Standard existing equipment that has been certified to previously acceptable Standards encompassing:

- processes and procedures used; and
- possible outcomes.

T19 A clause by clause assessment between the equipment manufacturing

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REQUIRED SKILLS AND KNOWLEDGE

Standard(s) and the current acceptable Ex Standards encompassing:

- processes and procedures used; and
- differences between the Standards that may be detected.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assess explosion protected equipment for compliance with Standards as described in 8) and including:

    A Following OHS procedures

    B Determining the certification specification of the equipment to be assessed.

    C Obtaining and understanding the relevant Standards to be used, including various national and international Standards

    D Accurately comparing documented certification criteria with the requirements of the various

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EVIDENCE GUIDE

certification schemes.

E Identifying discrepancies relating to the certification documentation used.

F Making appropriate recommendations of actions to correctly address discrepancies.

G Producing a conformity assessment document that clearly informs whether the equipment provides an 'equivalent level of safety' to be installed, maintained, overhauled/repaired and used safely in a hazardous area.

H Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assessing explosion protected equipment for compliance with Standards.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')
- Pressurisation (Ex 'p')

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM037A Conduct a conformity assessment of explosion-protected equipment - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE084A – Write specifications for electrotechnology engineering projects	
4	Update		Update pre-requisite UEENEEE124A – Compile and produce an energy sector detailed report	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers assessing the Certification documentation of explosion-protected equipment with a certificate of conformity other than an IEC Ex, ANZ Ex or AUS Ex Certificate, and producing a conformity assessment document. It encompasses skills and knowledge to examine and compare document content, compare requirements of IEC or AS/NZS Standards with alternative Standards on which the original certification was based, knowledge of explosion-protection techniques and technical report writing.

This unit is directly equivalent to the Unit *2.9 Conduct a conformity assessment of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Note
This unit is for the preparation of a conformity assessment

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Unit Descriptor **1**)

1.1) **Descriptor**

document, including Standards to alternative Standards assessment only.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering job functions, which involve design and selection of explosion-protected electrical equipment.

Note:
Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships and the like

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing at AQF 5 or equivalent. Example are (but not limited to):

UEENEEC004B	Prepare specifications for the supply of materials and equipment for electrotechnology projects
UEENEEE015B	Develop design briefs for electrotechnology projects
UEENEEE084A	Write specifications for electrotechnology engineering projects
UEENEEE124A	Compile and produce an energy sector detailed report

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct conformity assessment.	1.1	Certification documentation is obtained and read to determine the certification specifications for which the equipment has been assessed.
	1.2	Relevant Standards required to begin the conformity assessment are obtained in accordance with established procedures.
	1.3	OHS policies and procedures are followed where a site inspection is required to identify equipment subject to the conformity assessment that is already installed. NOTE: The conformity assessment document process is essentially a desktop process.
2 Conduct conformity assessment.	2.1	Conformity assessment is carried out in accordance with OHS and other established procedures.
	2.2	Knowledge of IEC or AS/NZS Standards is applied to a detailed comparison with alternative Standards on which original certification is

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ELEMENT	PERFORMANCE CRITERIA	
		based.
	2.3	The documented certification criteria of the equipment are compared to those required by currently acceptable Standards, including any test on which the certification is based. NOTE: The conformity assessment document will provide, in addition to the direct product evaluation, any information that is relevant to its use, e.g. installation, maintenance, overhaul/repair and conditions of use.
	2.4	Discrepancies between the certification documentation and IEC or AS/NZS Standards are identified and actions needed to correctly address each of these are recorded.
3 Document and submit conformity assessment report. .	3.1	Conformity assessment results are documented in a conformity assessment document, which informs whether the equipment provides an 'equivalent level of safety' to be installed, maintained, overhauled/repaired and used safely in a hazardous area.
	3.2	Recommendations for corrective actions to address discrepancies are included in the conformity assessment document.
	3.3	Conformity assessment document is forwarded to appropriate personnel in accordance with established procedures for inclusion in the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assessing explosion protected equipment for compliance with Standards.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM037 A Explosion-protected equipment conformity assessment

Evidence shall show an understanding of explosion-protected equipment conformity assessment to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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REQUIRED SKILLS AND KNOWLEDGE

protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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REQUIRED SKILLS AND KNOWLEDGE

techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 The compliance certification and the ‘Ex’ scheme for recognition of certification encompassing:

- the purposes of certification of explosion-protected equipment;
- the parties involved in the assessment/testing and certification of explosion-protected equipment and their responsibilities; and
- the process for recognition of assessment/testing and certification of explosion-protected equipment from other countries.

T15 The preparation required to assess explosion-protected equipment for compliance with Standards encompassing:

- the special safety measures that should be taken when assessing/testing explosion-protected equipment;
- documentation required prior to conducting conformity assessment;
- tests necessary to establish that an item of explosion-protected equipment conforms with relevant Standards; and
- situations where testing is not applicable or required.

T16 Assessing and testing explosion-protected equipment encompassing:

- assessment and test requirements; and.
- procedures for conducting a conformity assessment.

T17 Documentation used in assessing explosion-protected equipment for conformance to accepted Standards encompassing:

- The documentation and Standard(s) required to begin an assessment.
- The differences between the test requirements of Standards from other countries and the compliant/acceptable Standards against which the equipment is being assessed.
- Results given in equipment test reports.
- Conformity assessment processes and procedures.

T18 Assessing to a current acceptable Standard existing equipment that has been certified to previously acceptable Standards encompassing:

- processes and procedures used; and
- possible outcomes.

T19 A clause by clause assessment between the equipment manufacturing

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REQUIRED SKILLS AND KNOWLEDGE

Standard(s) and the current acceptable Ex Standards encompassing:

- processes and procedures used; and
- differences between the Standards that may be detected.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assess explosion protected equipment for compliance with Standards as described in 8) and including:

    A Following OHS procedures

    B Determining the certification specification of the equipment to be assessed.

    C Obtaining and understanding the relevant Standards to be used, including various national and international Standards

    D Accurately comparing documented certification criteria with the requirements of the various

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EVIDENCE GUIDE

certification schemes.

E Identifying discrepancies relating to the certification documentation used.

F Making appropriate recommendations of actions to correctly address discrepancies.

G Producing a conformity assessment document that clearly informs whether the equipment provides an 'equivalent level of safety' to be installed, maintained, overhauled/repaired and used safely in a hazardous area.

H Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assessing explosion protected equipment for compliance with Standards.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competencies in compliance assessment of electrical / electronic equipment and general technical evaluation and report writing.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM038A Conduct testing of hazardous areas installations - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH162A Verify compliance and functionality of fire protection system installations	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF111A Test, report and rectify faults in data and voice installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for electrical, electronic, instrument and data communication installations for hazardous areas. It requires the ability to select, prepare and use appropriate testing devices, work safely and to Standards and to interpret and record test results.

This unit is directly equivalent to the Unit *2.10 Conduct testing of hazardous areas installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for*

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Unit Descriptor **1**)

1.1) **Descriptor**

hazardous areas (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Note.
This unit is directly equivalent to the Unit ..... in the Australian/New Zealand Standard AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication installation and/or maintenance job functions. . It is suitable for employment-based programs under an approved contract of training.

Note:
Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

and

competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEH162A	Verify compliance and functionality of fire protection system installations
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF11	Test, report and rectify faults in data and

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Prerequisite Unit(s) **2)**

1A voice installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct testing.	1.1	OHS policies and procedures for preparing to work in an area where a potentially explosive atmosphere may be present are followed.
	1.2	Area classification is ascertained from the hazardous area layout drawings or other classification documents.
	1.3	Location of each item of equipment and of circuits subject to testing is determined from design drawings and documentation.
	1.4	Special tools, equipment and testing devices needed for the testing work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Conduct testing.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Parts of equipment that are dismantled in order to conduct testing are stored to protect them against loss or damage.
	2.3	Certified and approved low energy testing devices are selected and used to test into areas where explosive hazard may be present.
	2.4	Sensitive circuit components that require to be tested which are likely to be damaged by high-test voltages are tested by an appropriate testing method.
	2.5	Tests necessary to determine whether the electrical system complies with requirements for the explosion-protection techniques to be used and for electrical safety are conducted in accordance with established procedures.
	2.6	When testing has been completed, equipment parts and circuit connections are replaced in a manner that ensures the integrity of the explosion-protection system.
3 Confirm and document test results.	3.1	Non-conformances and faults revealed by the testing and the resulting recommended actions are documented and reported to appropriate personnel.
	3.2	Completion of testing is verified and a copy of the testing documentation submitted to the appropriate personnel for inclusion in the verification dossier in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM038 Hazardous area installations testing A

Evidence shall show an understanding of hazardous area installations testing to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T13 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T14 Preparation for conducting installation testing in a hazardous area encompassing:

- OHS procedures to be followed for working in a hazardous area; and
- procedures for determining whether a given hazardous area is safe to conduct electrical testing.

T15 Characteristics and limitations of testing equipment used to test installation in hazardous areas encompassing:

- testing devices required to test an installation in a hazardous area; and
- the suitability of testing device for use in a hazardous area.

T16 Documentation of results of hazardous area installation tests encompassing:

- test results that should be recorded in a verification dossier; and
- procedures and options for dealing with test results that show non-conformance.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Test installations in hazardous areas as described in 8) and including:

    A Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, plant and electrical isolation.

    B Identifying the nature of the hazardous areas and location of equipment and circuits to be tested.

    C Selecting appropriately certified testing devices and approved tools.

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EVIDENCE GUIDE

D Conducting the required tests correctly and without damaging circuits or equipment.

E Reassembling/reconnecting equipment at the completion of testing that ensures the integrity of the explosion-protection system is maintained.

F Identifying non-conformances and faults from test results.

G Documenting testing outcomes.

H Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area
and
Competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')

Note 'I' signifies Group I equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM039A Conduct testing of hazardous areas installations - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH162A Verify compliance and functionality of fire protection system installations	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF111A Test, report and rectify faults in data and voice installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for electrical, electronic, instrument and data communication installations for hazardous areas. It requires the ability to select, prepare and use appropriate testing devices, work safely and to Standards and to interpret and record test results.

This unit is directly equivalent to the Unit *2.10 Conduct testing of hazardous areas installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for*

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Unit Descriptor **1**)

1.1) **Descriptor**

hazardous areas (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication installation and/or maintenance job functions. . It is suitable for employment-based programs under an approved contract of training.

Note:
Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEH162A	Verify compliance and functionality of fire protection system installations
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF11	Test, report and rectify faults in data and

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Prerequisite Unit(s) **2)**

1A voice installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct testing.	1.1	OHS policies and procedures for preparing to work in an area where a potentially explosive atmosphere may be present are followed.
	1.2	Area classification is ascertained from the hazardous area layout drawings or other classification documents.
	1.3	Location of each item of equipment and of circuits subject to testing is determined from design drawings and documentation.
	1.4	Special tools, equipment and testing devices needed for the testing work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Conduct testing.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Parts of equipment that are dismantled in order to conduct testing are stored to protect them against loss or damage.
	2.3	Certified and approved low energy testing devices are selected and used to test into areas where explosive hazard may be present.
	2.4	Sensitive circuit components that require to be tested which are likely to be damaged by high-test voltages are tested by an appropriate testing method.
	2.5	Tests necessary to determine whether the electrical system complies with requirements for the explosion-protection techniques to be used and for electrical safety are conducted in accordance with established procedures.
	2.6	When testing has been completed, equipment parts and circuit connections are replaced in a manner that ensures the integrity of the explosion-protection system.
3 Confirm and document test results.	3.1	Non-conformances and faults revealed by the testing and the resulting recommended actions are documented and reported to appropriate personnel.
	3.2	Completion of testing is verified and a copy of the testing documentation submitted to the appropriate personnel for inclusion in the verification dossier in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM03 Hazardous area installations testing 9A

Evidence shall show an understanding of hazardous area installations testing to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T13 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T14 Preparation for conducting installation testing in a hazardous area encompassing:

- OHS procedures to be followed for working in a hazardous area; and
- procedures for determining whether a given hazardous area is safe to conduct electrical testing.

T15 Characteristics and limitations of testing equipment used to test installation in hazardous areas encompassing:

- testing devices required to test an installation in a hazardous area; and
- the suitability of testing device for use in a hazardous area.

T16 Documentation of results of hazardous area installation tests encompassing:

- test results that should be recorded in a verification dossier; and
- procedures and options for dealing with test results that show non-conformance.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Test installations in hazardous areas as described in 8) and including:

    A Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, plant and electrical isolation.

    B Identifying the nature of the hazardous areas and location of equipment and circuits to be tested.

    C Selecting appropriately certified testing devices and approved tools.

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EVIDENCE GUIDE

D Conducting the required tests correctly and without damaging circuits or equipment.

E Reassembling/reconnecting equipment at the completion of testing that ensures the integrity of the explosion-protection system is maintained.

F Identifying non-conformances and faults from test results.

G Documenting testing outcomes.

H Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area
and
Competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM040A Conduct testing of hazardous areas installations - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH162A Verify compliance and functionality of fire protection system installations	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF111A Test, report and rectify faults in data and voice installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for electrical, electronic, instrument and data communication installations for hazardous areas. It requires the ability to select, prepare and use appropriate testing devices, work safely and to Standards and to interpret and record test results.

This unit is directly equivalent to the Unit *2.10 Conduct testing of hazardous areas installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for*

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Unit Descriptor **1**)

1.1) **Descriptor**

hazardous areas (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication installation and/or maintenance job functions. . It is suitable for employment-based programs under an approved contract of training.

Note:
Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

and

competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEH162A	Verify compliance and functionality of fire protection system installations
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF11	Test, report and rectify faults in data and

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Prerequisite Unit(s)	**2)**	
	1A	voice installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct testing.	1.1	OHS policies and procedures for preparing to work in an area where a potentially explosive atmosphere may be present are followed.
	1.2	Area classification is ascertained from the hazardous area layout drawings or other classification documents.
	1.3	Location of each item of equipment and of circuits subject to testing is determined from design drawings and documentation.
	1.4	Special tools, equipment and testing devices needed for the testing work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Conduct testing.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Parts of equipment that are dismantled in order to conduct testing are stored to protect them against loss or damage.
	2.3	Certified and approved low energy testing devices are selected and used to test into areas where explosive hazard may be present.
	2.4	Sensitive circuit components that require to be tested which are likely to be damaged by high-test voltages are tested by an appropriate testing method.
	2.5	Tests necessary to determine whether the electrical system complies with requirements for the explosion-protection techniques to be used and for electrical safety are conducted in accordance with established procedures.
	2.6	When testing has been completed, equipment parts and circuit connections are replaced in a manner that ensures the integrity of the explosion-protection system.
3 Confirm and document test results.	3.1	Non-conformances and faults revealed by the testing and the resulting recommended actions are documented and reported to appropriate personnel.
	3.2	Completion of testing is verified and a copy of the testing documentation submitted to the appropriate personnel for inclusion in the verification dossier in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM040 Hazardous area installations testing A

Evidence shall show an understanding of hazardous area installations testing to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices

T13 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T14 Preparation for conducting installation testing in a hazardous area encompassing:

- OHS procedures to be followed for working in a hazardous area; and
- procedures for determining whether a given hazardous area is safe to conduct electrical testing.

T15 Characteristics and limitations of testing equipment used to test installation in hazardous areas encompassing:

- testing devices required to test an installation in a hazardous area; and
- the suitability of testing device for use in a hazardous area.

T16 Documentation of results of hazardous area installation tests encompassing:

- test results that should be recorded in a verification dossier; and
- procedures and options for dealing with test results that show non-conformance.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Test installations in hazardous areas as described in 8) and including:

    A Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, plant and electrical isolation.

    B Identifying the nature of the hazardous areas and location of equipment and circuits to be tested.

    C Selecting appropriately certified testing devices and approved tools.

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EVIDENCE GUIDE

D Conducting the required tests correctly and without damaging circuits or equipment.

E Reassembling/reconnecting equipment at the completion of testing that ensures the integrity of the explosion-protection system is maintained.

F Identifying non-conformances and faults from test results.

G Documenting testing outcomes.

H Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area
and
Competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM041A Conduct testing of hazardous area installations - pressurisation

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A - Verify compliance and functionality of low voltage general electrical installations	
4	Update		Update recommended pre-requisite UEENEEH162A Verify compliance and functionality of fire protection system installations	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	
4	Update		Update recommended pre-requisite UEENEEF111A Test, report and rectify faults in data and voice installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for electrical, electronic, instrument and data communication installations for hazardous areas. It requires the ability to select, prepare and use appropriate testing devices, work safely and to Standards and to interpret and record test results.

This unit is directly equivalent to the Unit *2.10 Conduct testing of hazardous areas installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for*

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Unit Descriptor **1**)

1.1) **Descriptor**

hazardous areas (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication installation and/or maintenance job functions. . It is suitable for employment-based programs under an approved contract of training.

Note:
Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

and

competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations has been achieved at AQF 3 or equivalent. Examples are (but not limited to):

UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEH162A	Verify compliance and functionality of fire protection system installations
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations
UEENEEF11	Test, report and rectify faults in data and

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Prerequisite Unit(s) **2)**

1A voice installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to conduct testing.	1.1	OHS policies and procedures for preparing to work in an area where a potentially explosive atmosphere may be present are followed.
	1.2	Area classification is ascertained from the hazardous area layout drawings or other classification documents.
	1.3	Location of each item of equipment and of circuits subject to testing is determined from design drawings and documentation.
	1.4	Special tools, equipment and testing devices needed for the testing work are obtained and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Conduct testing.	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Parts of equipment that are dismantled in order to conduct testing are stored to protect them against loss or damage.
	2.3	Certified and approved low energy testing devices are selected and used to test into areas where explosive hazard may be present.
	2.4	Sensitive circuit components that require to be tested which are likely to be damaged by high-test voltages are tested by an appropriate testing method.
	2.5	Tests necessary to determine whether the electrical system complies with requirements for the explosion-protection techniques to be used and for electrical safety are conducted in accordance with established procedures.
	2.6	When testing has been completed, equipment parts and circuit connections are replaced in a manner that ensures the integrity of the explosion-protection system.
3 Confirm and document test results.	3.1	Non-conformances and faults revealed by the testing and the resulting recommended actions are documented and reported to appropriate personnel.
	3.2	Completion of testing is verified and a copy of the testing documentation submitted to the appropriate personnel for inclusion in the verification dossier in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM04 Hazardous area installations testing 1A

Evidence shall show an understanding of hazardous area installations testing to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T13 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T14 Preparation for conducting installation testing in a hazardous area encompassing:

- OHS procedures to be followed for working in a hazardous area; and
- procedures for determining whether a given hazardous area is safe to conduct electrical testing.

T15 Characteristics and limitations of testing equipment used to test installation in hazardous areas encompassing:

- testing devices required to test an installation in a hazardous area; and
- the suitability of testing device for use in a hazardous area.

T16 Documentation of results of hazardous area installation tests encompassing:

- test results that should be recorded in a verification dossier; and
- procedures and options for dealing with test results that show non-conformance.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Test installations in hazardous areas as described in 8) and including:

    A Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, plant and electrical isolation.

    B Identifying the nature of the hazardous areas and location of equipment and circuits to be tested.

    C Selecting appropriately certified testing devices and approved tools.

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EVIDENCE GUIDE

D Conducting the required tests correctly and without damaging circuits or equipment.

E Reassembling/reconnecting equipment at the completion of testing that ensures the integrity of the explosion-protection system is maintained.

F Identifying non-conformances and faults from test results.

G Documenting testing outcomes.

H Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area
and
Competencies in conducting testing of general electrical, electronic, instrumentation and/or data communication installations.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area and the Pressurisation (Ex 'p') explosion-protection technique.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM042A Conduct visual inspection of hazardous areas installations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the explosion-protection aspects for conducting visual inspections of explosion-protected equipment and installations. It requires the ability to work safely in a hazardous area, and to identify conditions that affect the integrity of explosion-protection and document inspection findings.

This unit is directly equivalent to the Unit *2.11 Conduct visual inspection of hazardous areas installations* in the Australian/New Zealand Standard *AS*/*NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to hazardous area safety inspection related to plant or machinery operation or installations, maintenance or service functions at AQF 2 or higher.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control,

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Application of the Unit **4**)

marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions, at least at AQF 2 or equivalent. Example are (but not limited to):

UEENEEG005B	Verify compliance and functionality of general electrical installations
UEENEEI012B	Verify compliance and functionality of process control installations

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Prerequisite Unit(s) **2)**

MEM7.1B	Perform operational maintenance of machines/equipment
PMAOPS201B	Operate fluid flow equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for inspection.	1.1	Type and intended location of each item of equipment and circuits subject to inspection are determined from documentation.
	1.2	OHS policies and procedures for preparing to work in a hazardous area are followed.
2 Conduct inspection.	2.1	OHS policies and procedure for working in a hazardous area are followed.
	2.2	Condition of equipment is visually inspected for

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ELEMENT	PERFORMANCE CRITERIA	
		any signs of non-conformance. Note: Examples of non-conformance include - (a) excessive corrosion; (b) missing cover and mounting bolts; (c) enclosure or cable damage; (d) non-secured cables; (e) exposed armouring/cable cores at glanding point; or (f) Missing or illegible labels
3 Report inspection results.	3.1	Any non-conformances identified by the visual inspection are documented in accordance with established procedures
	3.2	Where applicable, documentation in relation to all aspects of the inspection is forwarded to the appropriate personnel for inclusion in the verification dossier in accordance with requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM04 Hazardous areas visual inspection 2A

Evidence shall show an understanding of the purpose and process of hazardous areas visual inspections to an extent indicated by the following aspects:

T1 Occupational, health and safety procedures encompassing:

- occupational, health and safety procedures to be followed before entering hazardous areas; and
- occupational, health and safety procedures to be followed while conducting visual inspection.

T2 Requirements for a verification dossier and relationship to as-built electrical installation.

T3 Purpose, scope and limitations of visual inspections.

T4 Documentation requirements resulting from a visual inspection.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

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EVIDENCE GUIDE

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated

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EVIDENCE GUIDE

within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct close inspection of existing hazardous areas installations as described in 8) and including:

    A Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, plant and electrical isolation

    B Identifying components of an installation and their location from documentation retained in the verification dossier. Inspecting equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design

    C Identifying visually compliant and non-compliant explosion-protected aspects of an electrical installation. Conducting close inspections

    D Documenting inspection outcomes

    E Applying relevant contingency management skills.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting close inspection of existing hazardous areas installations.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units:

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

Competencies required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to any classified hazardous area.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM043A Conduct detailed inspection of hazardous areas installations - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Edit		Correct numbering in Elements and Performance Criteria	
5	Update		Update recommended pre-requisite UEENEEG123A - Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of conducting initial, periodic and sample audit inspections close and detailed inspections of explosion-protected equipment and installations. It requires the ability to use a verification dossier, work safely in a hazardous area, inspect against Standards and report and act on inspection results.

This unit is directly equivalent to the Unit *2.12 Conduct detailed inspection of hazardous areas installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit 4)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication, installation, maintenance and/or inspection job functions. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in the following units.

UEENEEM023A	Install explosion-protected equipment and wiring systems coal mining

OR

UEENEEM027A	Maintain equipment in hazardous areas coal mining

OR

UEENEEM0	Report on the integrity of

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Prerequisite Unit(s)

2)

80A	explosion-protected equipment in a hazardous area
AND	
UEENEEM054A	Plan electrical installations for hazardous areas)
OR	
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area
AND	
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase

Employability Skills Information

Employability Skills

3)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for inspection.	1.1	Type and grade of inspection is ascertained from the inspection schedule retained in the verification dossier.
	1.2	Areas classification is ascertained from hazardous areas layout drawings retained in the verification dossier.
	1.3	Type and intended location of each item of equipment and circuits subject to inspection are determined from design drawings and documentation.
	1.4	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.5	Special tools, equipment and devices needed for the inspection are obtained and checked for correct operation and safety.
2 Conduct inspection	2.1	OHS policies and procedure for working in a hazardous area are followed.
	2.2	Where applicable, an appropriately qualified person is directed to access equipment to facilitate the inspection.
	2.3	Parts of equipment that are dismantled in order to conduct inspection are stored to protect them against loss or damage.
	2.4	Equipment, systems and installation are inspected for compliance with the design specifications retained in the verification dossier and in accordance with requirements.
	2.5	Where applicable, after the inspection of each item, equipment parts and circuit connections are replaced in a manner that ensures the integrity of the explosion-protection system.

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ELEMENT	PERFORMANCE CRITERIA
3 Report inspection results	3.1 Any non-conformances, faults or unauthorised modifications are documented in accordance with established procedures.
	3.2 Where applicable, a non-conformance report, including the actions taken and a statement on whether circuits have been re-energised, is made and forwarded to the appropriate personnel.
	3.3 Documentation in relation to all aspects of the inspection is forwarded to the appropriate personnel for inclusion in the verification dossier in accordance with requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting detailed inspection of hazardous areas installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM043 A Hazardous areas detailed inspection techniques

Evidence shall show an understanding of hazardous areas detailed inspection techniques to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T15 The relationship between the documentation held in a verification dossier and the installed equipment encompassing:

- consistency between the location and type of equipment with the area classification details in the verification dossier; and
- equipment certification and any attached conditions that relate to the

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equipment as it is installed.

T16 Inspecting a hazardous area installation encompassing:

- typical processes for undertaking the inspection of a hazardous area installation;
- requirements applicable to a given installation; and
- reporting of an inspection of a hazardous area installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct detailed inspection of hazardous areas installations as described in 8) and including:

    A Working safely in a hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.

    B Determining the extent of the inspection and location of equipment.

    C Conducting close and detailed inspections in accordance with requirements and procedures.

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EVIDENCE GUIDE

D Ensuring appropriate handling of dismantled parts of equipment.

E Ensuring replacement of equipment parts and connections that maintain the integrity of the explosion-protection system at the completion of each inspection.

F Documenting inspection outcomes

G Applying relevant contingency management skills.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting detailed inspection of hazardous areas installations.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following:

NEENEEG023B Conduct compliance inspection of electrical installations with demand exceeding 100 A per phase

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

UEENEEM023A Install explosion-protected equipment and wiring systems coal mining

UEENEEM027A Maintain equipment in hazardous areas coal mining

UEENEEM054A Plan electrical installations for hazardous areas

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')

Note: 'I' signifies Group I equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5)**

Hazards

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UEENEEM044A Conduct detailed inspection of hazardous areas installations - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Edit		Correct numbering in Elements and Performance Criteria	
5	Update		Update pre-requisite UEENEEG123A - Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of conducting close and detailed inspections of explosion-protected equipment and installations. It requires the ability to use a verification dossier, work safely in a hazardous area, inspect against Standards and report and act on inspection results.

This unit is directly equivalent to the Unit *2.12 Conduct detailed inspection of hazardous areas installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit 4)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication, installation, maintenance and/or inspection job functions. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in the following units.

UEENEEM024A	Install explosion-protected equipment and wiring systems gas atmospheres

OR

UEENEEM028A	Maintain equipment in hazardous areas gas atmospheres

OR

UEENEEM0	Report on the integrity of

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Prerequisite Unit(s)

2)

80A	explosion-protected equipment in a hazardous area
AND	
UEENEEM054A	Plan electrical installations for hazardous areas)
OR	
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area
AND	
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase

Employability Skills Information

Employability Skills

3)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for inspection	1.1	Type and grade of inspection is ascertained from the inspection schedule retained in the verification dossier.
	1.2	Areas classification is ascertained from hazardous areas layout drawings retained in the verification dossier.
	1.3	Type and intended location of each item of equipment and circuits subject to inspection are determined from design drawings and documentation
	1.4	OHS policies and procedures for preparing to work in a hazardous area are followed
	1.5	Special tools, equipment and devices needed for the inspection are obtained and checked for correct operation and safety
2 Conduct inspection	2.1	OHS policies and procedure for working in a hazardous area are followed.
	2.2	Where applicable, an appropriately qualified person is directed to access equipment to facilitate the inspection.
	2.3	Parts of equipment that are dismantled in order to conduct inspection are stored to protect them against loss or damage.
	2.4	Equipment, systems and installation are inspected for compliance with the design specifications retained in the verification dossier and in accordance with requirements.
	2.5	Where applicable, after the inspection of each item, equipment parts and circuit connections are replaced in a manner that ensures the integrity of the explosion-protection system.

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ELEMENT	PERFORMANCE CRITERIA	
3 Report inspection results	3.1	Any non-conformances, faults or unauthorised modifications are documented in accordance with established procedures.
	3.2	Where applicable, a non-conformance report, including the actions taken and a statement on whether circuits have been re-energised, is made and forwarded to the appropriate personnel.
	3.3	Documentation in relation to all aspects of the inspection are forwarded to the appropriate personnel for inclusion in the verification dossier in accordance with requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting detailed inspection of hazardous areas installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM044 A Hazardous areas detailed inspection techniques

Evidence shall show an understanding of hazardous areas detailed inspection techniques to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T15 The relationship between the documentation held in a verification dossier and the installed equipment encompassing:

- consistency between the location and type of equipment with the area classification details in the verification dossier; and
- equipment certification and any attached conditions that relate to the

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REQUIRED SKILLS AND KNOWLEDGE

equipment as it is installed.

T16 Inspecting a hazardous area installation encompassing:

- typical processes for undertaking the inspection of a hazardous area installation;
- requirements applicable to a given installation; and
- reporting of an inspection of a hazardous area installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct detailed inspection of hazardous areas installations as described in 8) and including:

    A Working safely in a hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation

    B Determining the extent of the inspection and location of equipment Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design

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EVIDENCE GUIDE

C Conducting close and detailed inspections in accordance with requirements and procedures. Identifying non-compliant apparatus

D Ensuring appropriate handling of dismantled parts of equipment Identifying non-compliant installation methods

E Ensuring replacement of equipment parts and connections that maintain the integrity of the explosion-protection system at the completion of each inspection.

F Documenting inspection outcomes

G Applying relevant contingency management skills.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting detailed inspection of hazardous areas installations.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following:

NEENEEG023B Conduct compliance inspection of electrical installations with demand exceeding 100 A per phase.

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

UEENEEM024A Install explosion-protected equipment and wiring systems gas atmospheres

UEENEEM028A Maintain equipment in hazardous areas gas atmospheres

UEENEEM054A Plan electrical installations for hazardous areas

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')

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RANGE STATEMENT

- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM045A Conduct detailed inspection of hazardous areas installations - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Edit		Correct numbering in Elements and Performance Criteria	
5	Update		Update pre-requisite UEENEEG123A - Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of conducting close and detailed inspections of explosion-protected equipment and installations. It requires the ability to use a verification dossier, work safely in a hazardous area, inspect against Standards and report and act on inspection results.

This unit is directly equivalent to the Unit *2.12 Conduct detailed inspection of hazardous areas installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit 4)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication, installation, maintenance and/or inspection job functions. This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in the following units.

UEENEEM025A	Install explosion-protected equipment and wiring systems - dust atmospheres

OR

UEENEEM029A	Maintain equipment in hazardous areas dust atmospheres

OR

UEENEEM0	Report on the integrity of

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Prerequisite Unit(s)

2)

80A	explosion-protected equipment in a hazardous area
AND	
UEENEEM054A	Plan electrical installations for hazardous areas)
OR	
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area
AND	
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase

Employability Skills Information

Employability Skills

3)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for inspection Audit records system	1.1	Type and grade of inspection is ascertained from the inspection schedule retained in the verification dossier. Records system is reviewed to verify that essential hazardous area documentation is retained and procedures for maintaining records are established
	1.2	Areas classification is ascertained from hazardous areas layout drawings retained in the verification dossier. Hazardous area classification and design drawings and documentation are checked to verify that appropriate procedures have been followed in assuring the area is safe
2 Prepare for inspection	2.1	Type and intended location of each item of equipment and circuits subject to inspection are determined from design drawings and documentation
	2.2	OHS policies and procedures for preparing to work in a hazardous area are followed
	2.3	Special tools, equipment and devices needed for the inspection are obtained and checked for correct operation and safety
3 Conduct inspection	3.1	OHS policies and procedure for working in a hazardous area are followed.
	3.2	Where applicable, an appropriately qualified person is directed to access equipment to facilitate the inspection.
	3.3	Parts of equipment that are dismantled in order to conduct inspection are stored to protect them against loss or damage.
	3.4	Equipment, systems and installation are inspected for compliance with the design specifications retained in the verification dossier and in accordance with requirements.
	3.5	Where applicable, after the inspection of each item, equipment parts and circuit connections are

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ELEMENT	PERFORMANCE CRITERIA	
		replaced in a manner that ensures the integrity of the explosion-protection system.
4 Report inspection results	4.1	Any non-conformances, faults or unauthorised modifications are documented in accordance with established procedures.
	4.2	Where applicable, a non-conformance report, including the actions taken and a statement on whether circuits have been re-energised, is made and forwarded to the appropriate personnel.
	4.3	Documentation in relation to all aspects of the inspection are forwarded to the appropriate personnel for inclusion in the verification dossier in accordance with requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting detailed inspection of hazardous areas installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM045 A Hazardous areas detailed inspection techniques

Evidence shall show an understanding of hazardous areas detailed inspection techniques to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T15 The relationship between the documentation held in a verification dossier and the installed equipment encompassing:

- consistency between the location and type of equipment with the area classification details in the verification dossier; and
- equipment certification and any attached conditions that relate to the

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REQUIRED SKILLS AND KNOWLEDGE

equipment as it is installed.

T16 Inspecting a hazardous area installation encompassing:

- typical processes for undertaking the inspection of a hazardous area installation;
- requirements applicable to a given installation; and
- reporting of an inspection of a hazardous area installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct detailed inspection of hazardous areas installations as described in 8) and including:

    A Working safely in a hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation

    B Determining the extent of the inspection and location of equipment Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design

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EVIDENCE GUIDE

C Conducting close and detailed inspections in accordance with requirements and procedures. Identifying non-compliant apparatus

D Ensuring appropriate handling of dismantled parts of equipment Identifying non-compliant installation methods

E Ensuring replacement of equipment parts and connections that maintain the integrity of the explosion-protection system at the completion of each inspection.

F Documenting inspection outcomes

G Applying relevant contingency management skills.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting detailed inspection of hazardous areas installations.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following:

NEENEEG023B Conduct compliance inspection of electrical installations with demand exceeding 100 A per phase.

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

UEENEEM025A Install explosion-protected equipment and wiring systems dust atmospheres

UEENEEM029A Maintain equipment in hazardous areas dust atmospheres

UEENEEM054A Plan electrical installations for hazardous areas

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')

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RANGE STATEMENT

- Pressurization, (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5)**

Hazards

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UEENEEM046A Conduct detailed inspection of hazardous areas installations - pressurisation

Modification History

Release	Action	Core/Elective	Details	Points
4	Edit		Correct numbering in Elements and Performance Criteria	
5	Update		Update pre-requisite UEENEEG123A - Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of conducting close and detailed inspections of explosion-protected equipment and installations. It requires the ability to use a verification dossier, work safely in a hazardous area, inspect against Standards and report and act on inspection results.

This unit is directly equivalent to the Unit *2.12 Conduct detailed inspection of hazardous areas installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit 4)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication, installation, maintenance and/or inspection job functions. This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in the following units:

UEENEEM026A	Install explosion-protected equipment and wiring systems pressurisation

OR

UEENEEM030A	Maintain equipment in hazardous areas pressurisation

OR

UEENEEM0	Report on the integrity of

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Prerequisite Unit(s) **2)**

80A	explosion-protected equipment in a hazardous area
AND	
UEENEEM054A	Plan electrical installations for hazardous areas)
OR	
UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area
AND	
UEENEEG123A	Conduct compliance inspection of LV electrical installations with demand exceeding 100 A per phase

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for inspection.	1.1	Type and grade of inspection is ascertained from the inspection schedule retained in the verification dossier.
	1.2	Areas classification is ascertained from hazardous areas layout drawings retained in the verification dossier.
	1.3	Type and intended location of each item of equipment and circuits subject to inspection are determined from design drawings and documentation
	1.4	OHS policies and procedures for preparing to work in a hazardous area are followed
	1.5	Special tools, equipment and devices needed for the inspection are obtained and checked for correct operation and safety
2 Conduct inspection	2.1	OHS policies and procedure for working in a hazardous area are followed.
	2.2	Where applicable, an appropriately qualified person is directed to access equipment to facilitate the inspection.
	2.3	Parts of equipment that are dismantled in order to conduct inspection are stored to protect them against loss or damage.
	2.4	Equipment, systems and installation are inspected for compliance with the design specifications retained in the verification dossier and in accordance with requirements.
	2.5	Where applicable, after the inspection of each item, equipment parts and circuit connections are replaced in a manner that ensures the integrity of the explosion-protection system.

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ELEMENT	PERFORMANCE CRITERIA	
4 Report inspection results	3.1	Any non-conformances, faults or unauthorised modifications are documented in accordance with established procedures.
	3.2	Where applicable, a non-conformance report, including the actions taken and a statement on whether circuits have been re-energised, is made and forwarded to the appropriate personnel.
	3.3	Documentation in relation to all aspects of the inspection are forwarded to the appropriate personnel for inclusion in the verification dossier in accordance with requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conducting detailed inspection of hazardous areas installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM046 A Hazardous areas detailed inspection techniques

Evidence shall show an understanding of hazardous areas detailed inspection techniques to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance

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REQUIRED SKILLS AND KNOWLEDGE

distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the

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REQUIRED SKILLS AND KNOWLEDGE

equipment specified for an installation; and

- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T15 The relationship between the documentation held in a verification dossier and the installed equipment encompassing:

- consistency between the location and type of equipment with the area classification details in the verification dossier; and
- equipment certification and any attached conditions that relate to the

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REQUIRED SKILLS AND KNOWLEDGE

equipment as it is installed.

T16 Inspecting a hazardous area installation encompassing:

- typical processes for undertaking the inspection of a hazardous area installation;
- requirements applicable to a given installation; and
- reporting of an inspection of a hazardous area installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct detailed inspection of hazardous areas installations as described in 8) and including:

    A Working safely in a hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.

    B Determining the extent of the inspection and location of equipment Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.

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EVIDENCE GUIDE

C Conducting close and detailed inspections in accordance with requirements and procedures. Identifying non-compliant apparatus.

D Ensuring appropriate handling of dismantled parts of equipment Identifying non-compliant installation methods.

E Ensuring replacement of equipment parts and connections that maintain the integrity of the explosion-protection system at the completion of each inspection.

F Documenting inspection outcomes.

G Applying relevant contingency management skills.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting detailed inspection of hazardous areas installations.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following:

NEENEEG023B Conduct compliance inspection of electrical installations with demand exceeding 100 A per phase.

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

UEENEEM026A Install explosion-protected equipment and wiring systems pressurisation

UEENEEM030A Maintain equipment in hazardous areas pressurisation

UEENEEM054A Plan electrical installations for hazardous areas

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area and the Pressurisation (Ex 'p') explosion-protection technique.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these

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RANGE STATEMENT

and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM047A Develop and manage maintenance programs for hazardous areas electrical equipment - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEE110A Develop and implement energy sector maintenance programs	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of plant maintenance schemes. It requires the ability to develop and manage maintenance programs incorporating strategies for inspections, repair/overhaul/replacement of components and recording of maintenance outcomes.

This unit is directly equivalent to the Unit *2.13 Develop and manage maintenance programs for hazardous areas electrical equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication

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Application of the Unit **4**)

maintenance management job functions.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units:

UEENEEM027A	Maintain equipment in hazardous areas coal mining

OR

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in developing and managing general electrical/instrumentation maintenance programs at AQF 4 or equivalent An example is (but not limited to):

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Prerequisite Unit(s) **2)**

UEENEEE110A	Develop and implement energy sector maintenance programs

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish maintenance requirements.	1.1	Policies and procedures are developed to include OHS practices, skills required and frequency and level of maintenance work.
	1.2	Systems are established to manage and record maintenance work and up-to-date verification dossier in accordance with requirements.
	1.3	Level of repair to be done under maintenance work is established in accordance with requirements.
	1.4	Arrangements are made to check that the hazardous area, explosion-protected equipment

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ELEMENT		PERFORMANCE CRITERIA	
			and installation comply with the verification dossier.
		1.5	Discrepancies between the hazardous area, explosion-protected equipment and installation and the verification dossier are documented and arrangements made to ensure the area is appropriately classified and explosion-protection systems are adequate for the area classification.
2	Develop and implement maintenance schedule.	2.1	Maintenance schedules are developed from recommendations of Standards and equipment manufacturers and in accordance with requirements.
		2.2	Procedures are developed and implemented to ensure the maintenance program is followed in accordance with the planned schedule and site requirements.
		2.3	Procedures are developed and implemented to ensure the verification dossier is maintained in accordance with planned schedule and site requirements.
3	Evaluate maintenance program.	3.1	Periodic and sample inspection reports are used to ascertain maintenance quality and the need for revision of maintenance schedule and frequency.
		3.2	Maintenance schedule is periodically reviewed and revised to maintain the integrity of the explosion-protection system.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing and managing maintenance programs for hazardous areas electrical equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM047 Hazardous areas maintenance management A

Evidence shall show an understanding of hazardous areas maintenance management to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power

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REQUIRED SKILLS AND KNOWLEDGE

dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the

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REQUIRED SKILLS AND KNOWLEDGE

pressurization technique;

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results; and
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

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REQUIRED SKILLS AND KNOWLEDGE

T10 The responsibilities of a person managing activities or a site related to a hazardous area, encompassing:

- OHS procedures that are to be established;
- responsibilities for ensuring that a hazardous area is safe; and
- responsibilities and processes for establishing and maintaining a verification dossier.

T11 Explosion-protection strategies in relation to a hazardous area, encompassing:

- the process of classifying a hazardous area;
- various ways in which electrical systems /apparatus can be treated to prevent them from becoming an ignition source; and
- the cost of the different ways of treating electrical systems/apparatus associated with hazardous areas.

T12 Requirements for the maintenance of electrical systems associated with hazardous areas, encompassing:

- the type and grades of inspection of hazardous areas;
- maintenance programs for electrical explosion-protected systems/apparatus; and
- documentation requirements associated with maintenance procedures.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop and manage maintenance programs for hazardous areas electrical equipment as described in 8) and including:

    A Establishing maintenance policies and procedures that encompass OHS responsibilities.

    B Establishing management maintenance systems that address the special requirements for explosion-protected equipment and installations.

    C Ensuring a hazardous area is appropriately classified and explosion-protection strategies are

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EVIDENCE GUIDE

adequate.

D Developing and implementing maintenance plans and schedules in relation to explosion-protected equipment and installations.

E Evaluating maintenance programs in relation to explosion-protected equipment and installations.

F Applying relevant contingency management.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing and managing maintenance programs for hazardous areas electrical equipment.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following:

Competencies in developing and managing general electrical/instrumentation maintenance programs

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

UEENEEM027A Maintain equipment in hazardous areas coal mining

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to overhaul of equipment incorporating all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')

Note: 'I' signifies Group I equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of

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RANGE STATEMENT

the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM048A Develop and manage maintenance programs for hazardous areas electrical equipment - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEE110A Develop and implement energy sector maintenance programs	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of plant maintenance schemes. It requires the ability to develop and manage maintenance programs incorporating strategies for inspections, repair/overhaul/replacement of components and recording of maintenance outcomes.

This unit is directly equivalent to the Unit *2.13 Develop and manage maintenance programs for hazardous areas electrical equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication

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Application of the Unit **4**)

maintenance management job functions.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units:

UEENEEM028A	Maintain equipment in hazardous areas gas atmospheres

OR

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in developing and managing general electrical/instrumentation maintenance programs at AQF 4 or equivalent. An example is (but not limited to):

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Prerequisite Unit(s) **2)**

UEENEEE110A	Develop and implement energy sector maintenance programs

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish maintenance requirements.	1.1	Policies and procedures are developed to include OHS practices, skills required and frequency and level of maintenance work.
	1.2	Systems are established to manage and record maintenance work and up-to-date verification dossier in accordance with requirements.
	1.3	Level of repair to be done under maintenance work is established in accordance with requirements.
	1.4	Arrangements are made to check that the hazardous area, explosion-protected equipment

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ELEMENT	PERFORMANCE CRITERIA	
		and installation comply with verification dossier.
	1.5	Discrepancies between the hazardous area, explosion-protected equipment and installation and the verification dossier are documented and arrangements made to ensure the area is appropriately classified and explosion-protection systems are adequate for the area classification.
2 Develop and implement maintenance schedule.	2.1	Maintenance schedules are developed from recommendations of Standards and equipment manufacturers and in accordance with requirements.
	2.2	Procedures are developed and implemented to ensure the maintenance program is followed in accordance with the planned schedule and site requirements.
	2.3	Procedures are developed and implemented to ensure the verification dossier is maintained in accordance with planned schedule and site requirements.
3 Evaluate maintenance program.	3.1	Periodic and sample inspection reports are used to ascertain maintenance quality and the need for revision of maintenance schedule and frequency.
	3.2	Maintenance schedule is periodically reviewed and revised to maintain the integrity of the explosion-protection system.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing and managing maintenance programs for hazardous areas electrical equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM048 A Hazardous areas maintenance management

Evidence shall show an understanding of hazardous areas maintenance management to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power

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REQUIRED SKILLS AND KNOWLEDGE

dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the

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REQUIRED SKILLS AND KNOWLEDGE

pressurization technique;

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of 'close', 'sample' and 'periodic' inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results; and
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

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REQUIRED SKILLS AND KNOWLEDGE

T10 The responsibilities of a person managing activities or a site related to a hazardous area, encompassing:

- OHS procedures that are to be established;
- responsibilities for ensuring that a hazardous area is safe; and
- responsibilities and processes for establishing and maintaining a verification dossier.

T11 Explosion-protection strategies in relation to a hazardous area, encompassing:

- the process of classifying a hazardous area;
- various ways in which electrical systems /apparatus can be treated to prevent them from becoming an ignition source; and
- the cost of the different ways of treating electrical systems/apparatus associated with hazardous areas.

T12 Requirements for the maintenance of electrical systems associated with hazardous areas, encompassing:

- the type and grades of inspection of hazardous areas;
- maintenance programs for electrical explosion-protected systems/apparatus; and
- documentation requirements associated with maintenance procedures.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop and manage maintenance programs for hazardous areas electrical equipment as described in 8) and including:

    A Establishing maintenance policies and procedures that encompass OHS responsibilities.

    B Establishing management maintenance systems that address the special requirements for explosion-protected equipment and installations.

    C Ensuring a hazardous area is appropriately classified and explosion-protection strategies are

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EVIDENCE GUIDE

adequate.

D Developing and implementing maintenance plans and schedules in relation to explosion-protected equipment and installations.

E Evaluating maintenance programs in relation to explosion-protected equipment and installations.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing and managing maintenance programs for hazardous areas electrical equipment.

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EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following: Competencies in developing and managing general electrical/instrumentation maintenance programs UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area UEENEEM028A Maintain equipment in hazardous areas gas atmospheres

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM049A Develop and manage maintenance programs for hazardous areas electrical equipment - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEE110A Develop and implement energy sector maintenance programs	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of plant maintenance schemes. It requires the ability to develop and manage maintenance programs incorporating strategies for inspections, repair/overhaul/replacement of components and recording of maintenance outcomes.

This unit is directly equivalent to the Unit *2.13 Develop and manage maintenance programs for hazardous areas electrical equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication

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Application of the Unit **4**)

maintenance management job functions.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units:

UEENEEM029A	Maintain equipment in hazardous areas dust atmospheres

OR

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in developing and managing general electrical/instrumentation maintenance programs at AQF 4 or equivalent. An example is (but not limited to):

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Prerequisite Unit(s) **2)**

UEENEEE110A	Develop and implement energy sector maintenance programs

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish maintenance requirements.	1.1	Policies and procedures are developed to include OHS practices, skills required and frequency and level of maintenance work.
	1.2	Systems are established to manage and record maintenance work and up-to-date verification dossier in accordance with requirements.
	1.3	Level of repair to be done under maintenance work is established in accordance with requirements.
	1.4	Arrangements are made to check that the hazardous area, explosion-protected equipment

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ELEMENT		PERFORMANCE CRITERIA	
			and installation comply with the verification dossier.
		1.5	Discrepancies between the hazardous area, explosion-protected equipment and installation and the verification dossier are documented and arrangements made to ensure the area is appropriately classified and explosion-protection systems are adequate for the area classification.
2	Develop and implement maintenance schedule.	2.1	Maintenance schedules are developed from recommendations of Standards and equipment manufacturers and in accordance with requirements.
		2.2	Procedures are developed and implemented to ensure the maintenance program is followed in accordance with the planned schedule and site requirements.
		2.3	Procedures are developed and implemented to ensure the verification dossier is maintained in accordance with planned schedule and site requirements.
3	Evaluate maintenance program.	3.1	Periodic and sample inspection reports are used to ascertain maintenance quality and the need for revision of maintenance schedule and frequency.
		3.2	Maintenance schedule is periodically reviewed and revised to maintain the integrity of the explosion-protection system.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing and managing maintenance programs for hazardous areas electrical equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM049 Hazardous areas maintenance management A

Evidence shall show an understanding of hazardous areas maintenance management to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power

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REQUIRED SKILLS AND KNOWLEDGE

dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the

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REQUIRED SKILLS AND KNOWLEDGE

pressurization technique;

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of 'close', 'sample' and 'periodic' inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results; and
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

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REQUIRED SKILLS AND KNOWLEDGE

T10 The responsibilities of a person managing activities or a site related to a hazardous area, encompassing:

- OHS procedures that are to be established;
- responsibilities for ensuring that a hazardous area is safe; and
- responsibilities and processes for establishing and maintaining a verification dossier.

T11 Explosion-protection strategies in relation to a hazardous area, encompassing:

- the process of classifying a hazardous area;
- various ways in which electrical systems /apparatus can be treated to prevent them from becoming an ignition source; and
- the cost of the different ways of treating electrical systems/apparatus associated with hazardous areas.

T12 Requirements for the maintenance of electrical systems associated with hazardous areas, encompassing:

- the type and grades of inspection of hazardous areas;
- maintenance programs for electrical explosion-protected systems/apparatus; and
- documentation requirements associated with maintenance procedures.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop and manage maintenance programs for hazardous areas electrical equipment as described in 8) and including:

    A Establishing maintenance policies and procedures that encompass OHS responsibilities.

    B Establishing management maintenance systems that address the special requirements for explosion-protected equipment and installations.

    C Ensuring a hazardous area is appropriately classified and explosion-protection strategies are

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EVIDENCE GUIDE

adequate.

D Developing and implementing maintenance plans and schedules in relation to explosion-protected equipment and installations.

E Evaluating maintenance programs in relation to explosion-protected equipment and installations.

F Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing and managing maintenance programs for hazardous areas electrical equipment.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following:

Competencies in developing and managing general electrical/instrumentation maintenance programs

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

UEENEEM029A Maintain equipment in hazardous areas dust atmospheres

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM050A Develop and manage maintenance programs for hazardous areas electrical equipment - pressurisation

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEE110A Develop and implement energy sector maintenance programs	

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of plant maintenance schemes. It requires the ability to develop and manage maintenance programs incorporating strategies for inspections, repair/overhaul/replacement of components and recording of maintenance outcomes.

This unit is directly equivalent to the Unit *2.13 Develop and manage maintenance programs for hazardous areas electrical equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication

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Application of the Unit **4**)

maintenance management job functions.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units:

UEENEEM030A	Maintain equipment in hazardous areas pressurisation

OR

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies in developing and managing general electrical/instrumentation maintenance programs at AQF 4 or equivalent. An example is (but not limited to):

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Prerequisite Unit(s) **2)**

UEENEEE110A	Develop and implement energy sector maintenance programs

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish maintenance requirements.	1.1	Policies and procedures are developed to include OHS practices, skills required and frequency and level of maintenance work.
	1.2	Systems are established to manage and record maintenance work and up-to-date verification dossier in accordance with requirements.
	1.3	Level of repair to be done under maintenance work is established in accordance with requirements.
	1.4	Arrangements are made to check that the hazardous area, explosion-protected equipment

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ELEMENT	PERFORMANCE CRITERIA	
		and installation comply with the verification dossier.
	1.5	Discrepancies between the hazardous area, explosion-protected equipment and installation and the verification dossier are documented and arrangements made to ensure the area is appropriately classified and explosion-protection systems are adequate for the area classification.
2 Develop and implement maintenance schedule.	2.1	Maintenance schedules are developed from recommendations of Standards and equipment manufacturers and in accordance with requirements.
	2.2	Procedures are developed and implemented to ensure the maintenance program is followed in accordance with the planned schedule and site requirements.
	2.3	Procedures are developed and implemented to ensure the verification dossier is maintained in accordance with planned schedule and site requirements.
3 Evaluate maintenance program.	3.1	Periodic and sample inspection reports are used to ascertain maintenance quality and the need for revision of maintenance schedule and frequency.
	3.2	Maintenance schedule is periodically reviewed and revised to maintain the integrity of the explosion-protection system.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing and managing maintenance programs for hazardous areas electrical equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM05 Hazardous areas maintenance management 0A

Evidence shall show an understanding of hazardous areas maintenance management to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power

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REQUIRED SKILLS AND KNOWLEDGE

dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).

- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the

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REQUIRED SKILLS AND KNOWLEDGE

pressurization technique;

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of 'close', 'sample' and 'periodic' inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results; and
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

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REQUIRED SKILLS AND KNOWLEDGE

T10 The responsibilities of a person managing activities or a site related to a hazardous area, encompassing:

- OHS procedures that are to be established;
- responsibilities for ensuring that a hazardous area is safe; and
- responsibilities and processes for establishing and maintaining a verification dossier.

T11 Explosion-protection strategies in relation to a hazardous area, encompassing:

- the process of classifying a hazardous area;
- various ways in which electrical systems /apparatus can be treated to prevent them from becoming an ignition source; and
- the cost of the different ways of treating electrical systems/apparatus associated with hazardous areas.

T12 Requirements for the maintenance of electrical systems associated with hazardous areas, encompassing:

- the type and grades of inspection of hazardous areas;
- maintenance programs for electrical explosion-protected systems/apparatus; and
- documentation requirements associated with maintenance procedures.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop and manage maintenance programs for hazardous areas electrical equipment as described in 8) and including:

    A Establishing maintenance policies and procedures that encompass OHS responsibilities.

    B Establishing management maintenance systems that address the special requirements for explosion-protected equipment and installations.

    C Ensuring a hazardous area is appropriately classified and explosion-protection strategies are

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adequate.

D Developing and implementing maintenance plans and schedules in relation to explosion-protected equipment and installations.

E Evaluating maintenance programs in relation to explosion-protected equipment and installations.

F Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing and managing maintenance programs for hazardous areas electrical equipment.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following:

Competencies in developing and managing general electrical/instrumentation maintenance programs

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

UEENEEM030A Maintain equipment in hazardous areas pressurisation

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area and the Pressurisation (Ex 'p') explosion-protection technique.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM052A Classify hazardous areas - gas atmospheres

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers knowledge and skills to classify areas where flammable/combustible potentially explosive materials may exist. It requires the ability to gather and analyse data relative to explosion hazards, determine the extent of risk and establish and document zones.

This unit is directly equivalent to the Unit *2.16 Classify hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering job function at, at least, an engineering associate level.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units:

UEENEEE071B	Write specifications for electrical engineering projects

OR

UEENEEE075B	Write specifications for industrial electronics and control projects

OR

UEENEER002B	Contribute to the conduct of a research project

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Determine the type and extent of explosion hazard.	1.1	Functions and process equipment in the area are determined and hazardous materials identified from specifications, hazard and risk assessment and/or written consultation with process specialist personnel.
	1.2	Explosion and physical properties of hazardous materials are listed, together with the title of the authority from which the data is obtained.
	1.3	Gas Groupings and temperature class of flammable gases and vapours and /or dust that may be present in the area are established from collected data.
	1.4	Potential sources of release and/or dust layering are identified from specifications, and/or written consultation with process specialist personnel.

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ELEMENT	PERFORMANCE CRITERIA	
2 Establish the type and extent of zones.	2.1	Zones are determined by similarity to examples in Standards or from first principles.
	2.2	Where first principles are used, grades, sources and magnitude of release and dust layering are established from specifications and diagrams and reviewed with process specialist personnel. Note: This should include such matters as ventilation assessment, housekeeping assessment and calculations.
3 Document classification and delineation of zones.	3.1	Area classification documentation is completed in accordance with requirements and submitted to appropriate personnel.
	3.2	Classification documentation records are filed for future reference and for incorporation in the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and classifying hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM052A Hazardous areas classification

Evidence shall show an understanding of processes involved in gathering and analysing technical data to classify non-specific hazardous areas. The following aspects indicate the extent of understanding required.

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment;

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REQUIRED SKILLS AND KNOWLEDGE

enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties

Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.

- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 The process of classifying hazardous areas encompassing:

- methods by which an area can be classified;
- the characteristics/attributes of an area that should be considered in the classification process, for example, type of process, nature of plant, source and nature of release;
- the requirements and Standards for classifying a hazardous area; and
- the responsibilities of the owner/occupiers for classification of a hazardous area.

T6 The likelihood (zoning) or risk assessment method of an explosive hazard encompassing:

- ignition properties of materials relevant to determining the likelihood and extent of an explosive hazard;
- sources for obtaining data on ignition properties of materials under the conditions in which they could be present in a given process;
- methods for assessment and calculation of factors such as release rate , ventilation and dispersion characteristics; and and
- means for reducing hazard risk.

T7 The extent of an explosive hazard and classifying an area accordingly encompassing:

- the extent of zones for an area given data on the likelihood of the explosive hazard

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REQUIRED SKILLS AND KNOWLEDGE

for that area;

- requirements for documenting the classification of a hazardous area; and
- the extent of the zones, temperature classes and gas groups on site drawings in a hazardous area.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence

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EVIDENCE GUIDE

decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Classify hazardous areas as described in 8) and including:

    A Accessing necessary information and identifying hazardous products involved in a given process, explosive properties of materials involved in a given process, and potential sources and characteristics of release of hazardous products.

    B Analysing data in the context of explosion risk.

    C Determining area delineation and documenting area classifications.

    D Applying relevant contingency management skills.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to classifying hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with competencies related to gathering and analysing technical data and using this data for assessing risk.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to classifying a hazardous area in which gases are potentially an explosive hazard.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM053A Classify hazardous areas - dust atmospheres

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers knowledge and skills to classify areas where flammable/combustible materials may exist. It requires the ability to gather and analyse data relative to explosion hazards, determine the extent of risk and establish and document zones.

This unit is directly equivalent to the Unit *2.16 Classify hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering job function at, at least, an engineering associate level.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competency related to gathering and analysing technical data at AQF 6 or equivalent Examples are (but not limited to):

UEENEEE071B	Write specifications for electrical engineering projects

OR

UEENEEE075B	Write specifications for industrial electronics and control projects

OR

UEENEER002B	Contribute to the conduct of a research project

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Determine the type and extent of explosion hazard.	1.1	Functions and process equipment in the area are determined and hazardous materials identified from specifications, hazard and risk assessment and/or written consultation with process specialist personnel.
	1.2	Explosion and physical properties of hazardous materials are listed, together with the title of the authority from which the data is obtained.
	1.3	Gas Groupings and temperature class of flammable gases and vapours and /or dust that may be present in the area are established from collected data.
	1.4	Potential sources of release and/or dust layering are identified from specifications, risk assessment and/or written consultation with process specialist personnel.

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ELEMENT	PERFORMANCE CRITERIA	
2 Establish the type and extent of zones.	2.1	Zones are determined by similarity to examples in Standards or from first principles.
	2.2	Where first principles are used, grades, sources and magnitude of release and dust layering are established from specifications and diagrams and reviewed with process specialist personnel. Note: This should include such matters as ventilation assessment, housekeeping assessment and calculations.
3 Document classification and delineation of zones.	3.1	Area classification documentation is completed in accordance with requirements and submitted to appropriate personnel.
	3.2	Classification documentation records are filed for future reference and for incorporation in the verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and classifying hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM053 A Hazardous areas classification

Evidence shall show an understanding of processes involved in gathering and analysing technical data to classify non-specific hazardous areas. The following aspects indicate the extent of understanding required.

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area

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exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 The process of classifying hazardous areas encompassing:

- methods by which an area can be classified;
- the characteristics/attributes of an area that should be considered in the classification process, for example, type of process, nature of plant, source and nature of release;
- the requirements and Standards for classifying a hazardous area; and
- the responsibilities of the owner/occupiers for classification of a hazardous area.

T6 The likelihood (zoning) or risk assessment method of an explosive hazard encompassing:

- ignition properties of materials relevant to determining the likelihood and extent of an explosive hazard;
- sources for obtaining data on ignition properties of materials under the

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conditions in which they could be present in a given process;

- methods for assessment and calculation of factors such as release rate , ventilation and dispersion characteristics; and and
- means for reducing hazard risk.

T7 The extent of an explosive hazard and classifying an area accordingly encompassing:

- the extent of zones for an area given data on the likelihood of the explosive hazard for that area;
- requirements for documenting the classification of a hazardous area; and
- the extent of the zones, temperature classes and gas groups on site drawings in a hazardous area.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Classify hazardous areas as described in 8) and including:

    A Accessing necessary information and identifying hazardous products involved in a given process, explosive properties of materials involved in a given process, and potential sources and characteristics of release of hazardous products.

    B Analysing data in the context of explosion risk.

    C Determining area delineation and documenting area classifications.

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EVIDENCE GUIDE

D Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to classifying hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with competencies related to gathering and analysing technical data and using this data for assessing risk.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to classifying a hazardous areas in which dust is potentially an explosive hazard

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM054A Plan electrical installations for hazardous areas - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG125A Plan electrical installations with a low voltage demand up to 400 A per phase	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects planning electrical installations for hazardous areas It requires the ability to identify hazardous area zones from classification diagrams, or from examples of previously classified areas or those given in Standards, and to select and locate explosion-protected equipment and wiring systems and other items that may influence the explosion-protection technique.

This unit is directly equivalent to the Unit *2.17 Plan electrical installations for hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication design job functions.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units:

UEENEEM024A	Install explosion-protected equipment and wiring systems gas atmospheres

OR

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Prerequisite Unit(s) **2)**

Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent. Examples are (but not limited to):

UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Verify hazardous classification for the area.	1.1 Nature and characteristics of explosion hazards in the area are identified from plant specifications.
	1.2 In the absence of classification documentation, arrangements are made to ensure the explosion hazard in the area is assessed and the area

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ELEMENT		PERFORMANCE CRITERIA	
			classified.
		1.3	Classification, extent of zonings of the area, gas groups and temperature class are verified by reference to classification documents or Standards in which the explosion hazard, area classification and zonings are clearly identified.
2	Select and check equipment, wiring and accessories.	2.1	Equipment and accessories are selected to suit area activities and comply with explosion-protection requirements.
		2.2	Wiring systems are selected to suit area activities, and comply with explosion-protection, load and duty requirements.
		2.3	Equipment compliance certification is checked for suitability for the area classification and zonings.
		2.4	Cables and accessories are checked for suitability for the area classification and zonings and load and duty requirements.
3	Document installation plan.	3.1	Installation specifications are documented in accordance with established procedures and requirements.
		3.2	Arrangements are made to file as-built installation documentation in the verification dossier in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing electrical installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM054 Hazardous areas electrical installation planning

Evidence shall show an understanding of hazardous areas electrical installation planning to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the

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REQUIRED SKILLS AND KNOWLEDGE

classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics

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REQUIRED SKILLS AND KNOWLEDGE

and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex

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‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Cable termination types suitable for use in hazardous areas encompassing:

- Explosion protection features of cable terminations devices.
- Selecting compliant cable termination devices.

T18 Interpretation of documents showing the classification of a hazardous area encompassing:

- the methods used for classifying hazardous areas;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;
- the delineation of zones, temperature classes and gas groups of a given

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hazardous area from similar situations previously classified, such as those given in Standards; and

- situations where classification needs to be undertaken by a person competent in non-specific area classification i.e. a person who has attained either Units UEENEEM052A/UEENEEM053A Classify hazardous areas – gas atmospheres or dust atmospheres.

T19 Selecting and checking equipment, wiring and accessories encompassing:

- the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
- explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
- wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
- earthing and equipotential bonding requirements for a hazardous area installation;
- procedures used to check the compliance certification of equipment used in a hazardous area; and
- electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.

T20 Documentation of hazardous area installation design encompassing:

- the items that should be included in the documentation for the design of a hazardous area installation;
- installation layout, specification, work schedule and other documentation required for inclusion in a verification dossier; and
- the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/ accessories.

T21 Common and specific hazardous areas for which classification examples are given in Standards encompassing:

- The example classifications given in Standards
- application of the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design electrical installations in hazardous areas as described in 8) and including:

    A Interpreting area classification documentation or Standards.

    B Classifying area from Standards.

    C Documenting area classification.

    D Selecting equipment for a given classified area.

    E Selecting wiring systems for a given classified

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area.

F Checking equipment certification for suitability for a given classified area. Documenting as-built installation.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing electrical installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently any of the following units:

UEENEEM024A Install explosion-protected equipment and wiring systems gas atmospheres

Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM055A Plan electrical installations for hazardous areas - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEG125A Plan electrical installations with a low voltage demand up to 400 A per phase	
4	Update		Update pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects planning electrical installations for hazardous areas It requires the ability to identify hazardous area zones from classification diagrams or from examples of previously classified areas or those given in Standards, and to select and locate explosion-protected equipment and wiring systems and other items that may influence the explosion-protection technique.

This unit is directly equivalent to the Unit *2.17 Plan electrical installations for hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication design job functions.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units:

UEENEEM025A	Install explosion-protected equipment and wiring systems dust atmospheres

OR

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Prerequisite Unit(s) **2)**

Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent. Examples are (but not limited to):

UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Verify hazardous classification for the area.	1.1	Nature and characteristics of explosion hazards in the area are identified from plant specifications.
	1.2	In the absence of classification documentation, arrangements are made to ensure the explosion hazard in the area is assessed and the area

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ELEMENT		PERFORMANCE CRITERIA	
			classified.
		1.3	Classification, extent of zonings of the area, gas groups and temperature class are verified by reference to classification documents or Standards in which the explosion hazard, area classification and zonings are clearly identified.
2	Select and check equipment, wiring and accessories.	2.1	Equipment and accessories are selected to suit area activities and comply with explosion-protection requirements.
		2.2	Wiring systems are selected to suit area activities, and comply with explosion-protection, load and duty requirements.
		2.3	Equipment compliance certification is checked for suitability for the area classification and zonings.
		2.4	Cables and accessories are checked for suitability for the area classification and zonings and load and duty requirements.
3	Document installation plan.	3.1	Installation specifications are documented in accordance with established procedures and requirements.
		3.2	Arrangements are made to file as-built installation documentation in the verification dossier in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing electrical installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM05 5 Hazardous areas electrical installation planning

Evidence shall show an understanding of hazardous areas electrical installation planning to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Cable termination types suitable for use in hazardous areas encompassing:

- Explosion protection features of cable terminations devices.
- Selecting compliant cable termination devices.

T18 Interpretation of documents showing the classification of a hazardous area encompassing:

- the methods used for classifying hazardous areas;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;

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REQUIRED SKILLS AND KNOWLEDGE

- the delineation of zones, temperature classes and gas groups of a given hazardous area from similar situations previously classified, such as those given in Standards; and
- situations where classification needs to be undertaken by a person competent in non-specific area classification i.e. a person who has attained either Units UEENEEM052A/UEENEEM053A Classify hazardous areas – gas atmospheres or dust atmospheres.

T19 Selecting and checking equipment, wiring and accessories encompassing:

- the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
- explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
- wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
- earthing and equipotential bonding requirements for a hazardous area installation;
- procedures used to check the compliance certification of equipment used in a hazardous area; and
- electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.

T20 Documentation of hazardous area installation design encompassing:

- the items that should be included in the documentation for the design of a hazardous area installation;
- installation layout, specification, work schedule and other documentation required for inclusion in a verification dossier; and
- the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/ accessories.

T21 Common and specific hazardous areas for which classification examples are given in Standards encompassing:

- The example classifications given in Standards
- application of the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design electrical installations in hazardous areas as described in 8) and including:

    A Interpreting area classification documentation or Standards.

    B Classifying area from Standards.

    C Documenting area classification.

    D Selecting equipment for a given classified area.

    E Selecting wiring systems for a given classified

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area.

F Checking equipment certification for suitability for a given classified area. Documenting as-built installation.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing electrical installations in hazardous areas.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently any of the following units:

UEENEEM025A Install explosion-protected equipment and wiring systems dust atmospheres

Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5)**

Hazards

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UEENEEM056A Plan electrical installations for hazardous areas - pressurisation

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the explosion-protection aspects planning electrical installations for hazardous areas It requires the ability to identify hazardous area zones from classification diagrams, or from examples of previously classified areas or those given in Standards, and to select and locate explosion-protected equipment and wiring systems and other items that may influence the explosion-protection technique.

This unit is directly equivalent to the Unit *2.17 Plan electrical installations for hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication design job functions.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and

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Application of the Unit **4**)

dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units:

UEENEEM026A	Install explosion-protected equipment and wiring systems pressurisation

OR

Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent. Examples are (but not limited to):

UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Verify hazardous classification for the area.	1.1 Nature and characteristics of explosion hazards in the area are identified from plant specifications.
	1.2 In the absence of classification documentation, arrangements are made to ensure the explosion hazard in the area is assessed and the area classified.
	1.3 Classification, extent of zonings of the area, gas groups and temperature class are verified by reference to classification documents or Standards in which the explosion hazard, area classification and zonings are clearly identified.

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ELEMENT	PERFORMANCE CRITERIA	
2 Select and check equipment, wiring and accessories.	2.1	Equipment and accessories are selected to suit area activities and comply with explosion-protection requirements.
	2.2	Wiring systems are selected to suit area activities, and comply with explosion-protection, load and duty requirements.
	2.3	Equipment compliance certification is checked for suitability for the area classification and zonings.
	2.4	Cables and accessories are checked for suitability for the area classification and zonings and load and duty requirements.
3 Document installation plan.	3.1	Installation specifications are documented in accordance with established procedures and requirements.
	3.2	Arrangements are made to file as-built installation documentation in the verification dossier in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing electrical installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM05 Hazardous areas electrical installation planning 6

Evidence shall show an understanding of hazardous areas electrical installation planning to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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REQUIRED SKILLS AND KNOWLEDGE

protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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REQUIRED SKILLS AND KNOWLEDGE

techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Cable termination types suitable for use in hazardous areas encompassing:

- Explosion protection features of cable terminations devices.
- Selecting compliant cable termination devices.

T18 Interpretation of documents showing the classification of a hazardous area encompassing:

- the methods used for classifying hazardous areas;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;

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REQUIRED SKILLS AND KNOWLEDGE

- the delineation of zones, temperature classes and gas groups of a given hazardous area from similar situations previously classified, such as those given in Standards; and
- situations where classification needs to be undertaken by a person competent in non-specific area classification i.e. a person who has attained either Units UEENEEM052A/UEENEEM053A Classify hazardous areas – gas atmospheres or dust atmospheres.

T19 Selecting and checking equipment, wiring and accessories encompassing:

- the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
- explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
- wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
- earthing and equipotential bonding requirements for a hazardous area installation;
- procedures used to check the compliance certification of equipment used in a hazardous area; and
- electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.

T20 Documentation of hazardous area installation design encompassing:

- the items that should be included in the documentation for the design of a hazardous area installation;
- installation layout, specification, work schedule and other documentation required for inclusion in a verification dossier; and
- the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/ accessories.

T21 Common and specific hazardous areas for which classification examples are given in Standards encompassing:

- The example classifications given in Standards
- application of the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

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Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design electrical installations in hazardous areas as described in 8) and including:

    A Interpreting area classification documentation or Standards.

    B Classifying area from Standards.

    C Documenting area classification.

    D Selecting equipment for a given classified area.

    E Selecting wiring systems for a given classified

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area.

F Checking equipment certification for suitability for a given classified area. Documenting as-built installation.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing electrical installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently any of the following units: UEENEEM026A Install explosion-protected equipment and wiring systems pressurisation Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area and the Pressurisation (Ex 'p') explosion-protection technique.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM057A Design explosion-protected electrical systems and installations - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG130A Design switchboards rated for high fault levels (greater than 400 A)	
4	Update		Update recommended pre-requisite UEENEEI123A Design electronic control systems	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of designing electrical power, control and instrumentation systems and installations. It requires the ability to establish design briefs and to pursue economical and effective design solutions.

This unit is directly equivalent to the Unit *2.18 Design explosion-protected electrical systems and installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering design job function at, at least, an engineering associate level.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competency in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to):

UEENEEE115A	Develop design briefs for electrotechnology projects

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Prerequisite Unit(s) **2)**

UEENEEG130A	Design switchboards rated for high fault levels (greater than 400 A)
UEENEEI123A	Design electronic control systems

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish design brief.	1.1	Site and plant specifications are obtained and reviewed to establish the system requirements.
	1.2	Classification of the area is obtained from the hazardous area layout drawings or other classification documents.
	1.3	Organizational policies and specifications for hazardous area electrical systems are obtained or established with the appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA
2 Design system and installation.	2.1 Safety, functional and economic considerations are incorporated in system design.
	2.2 Design complies with all hazardous area requirements and includes specifications and all other necessary documentation for explosion-protected equipment, accessories and wiring systems.
3 Check and finalise design.	3.1 Design is checked by means of established procedures for compliance with all relevant requirements.
	3.2 Design is submitted for appropriate organizational approval and, where applicable, statutory or regulatory approval.
	3.3 Approved copies of design documents are issued for retention in the verification dossier in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing explosion-protected electrical systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM05 Hazardous area electrical systems design 7A

Evidence shall show an understanding of hazardous area electrical systems design to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Interpretation of documents showing the classification of a hazardous area encompassing:

- the methods used for classifying hazardous areas;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from similar situations previously classified, such as those given in Standards; and
- situations where classification needs to be undertaken by a person competent in

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non-specific area classification i.e. a person who has attained either Units UEENEEM052A/UEENEEM053A Classify hazardous areas – gas atmospheres or dust atmospheres.

T18 Selecting and checking equipment, wiring and accessories encompassing:

- the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
- explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
- wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
- earthing and equipotential bonding requirements for a hazardous area installation;
- procedures used to check the compliance certification of equipment used in a hazardous area; and
- electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.

T19 Documentation of hazardous area installation design encompassing:

- the items that should be included in the documentation for the design of a hazardous area installation;
- installation layout, specification, work schedule and other documentation required for inclusion in a verification dossier; and
- the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/ accessories.

T20 Common and specific hazardous areas for which classification examples are given in Standards encompassing:

- The example classifications given in Standards
- application of the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

T21 Process for establishing a design brief for an explosion-protected electrical system encompassing:

- consultation processes for establishing client requirements and preparing a design brief; and
- system requirements using site and plant specifications, hazardous area classifications and organization requirements.

T22 System design encompassing:

- major considerations influencing explosion-protected electrical system designs;
- requirements in Standards and regulations that affect the electrical system

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design; and

- typical design process incorporating explosion-protection in an electrical system.

T23 Design documentation required for a hazardous area encompassing:

- procedures for checking and approval of explosion-protected system design; and
- requirements for documenting a final design including documents to be included in a verification dossier.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design explosion-protected electrical systems as described in 8) and including:

    A Accessing and interpreting relevant information.

    B Providing design options and justifications including hazard risk, functionality and economic considerations.

    C Following checking and documentation procedures.

    D Applying relevant contingency management skills.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing explosion-protected electrical systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competencies in designing electrical systems.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM058A Design explosion-protected electrical systems and installations - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG130A Design switchboards rated for high fault levels (greater than 400 A)	
4	Update		Update recommended pre-requisite UEENEEI123A Design electronic control systems	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of designing electrical power, control and instrumentation systems and installations. It requires the ability to establish design briefs and to pursue economical and effective design solutions.

This unit is directly equivalent to the Unit *2.18 Design explosion-protected electrical systems and installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering design job function at, at least, an engineering associate level.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competency in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to):

UEENEEE015B	Develop design briefs for electrotechnology projects

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Prerequisite Unit(s) **2)**

UEENEEG 130A	Design switchboards rated for high fault levels (greater than 400 A)
UEENEEI1 23A	Design electronic control systems

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish design brief.	1.1	Site and plant specifications are obtained and reviewed to establish the system requirements.
	1.2	Classification of the area is obtained from the hazardous area layout drawings or other classification documents.
	1.3	Organizational policies and specifications for hazardous area electrical systems are obtained or established with the appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA
2 Design system and installation.	2.1 Safety, functional and economic considerations are incorporated in system design.
	2.2 Design complies with all hazardous area requirements and includes specifications and all other necessary documentation for explosion-protected equipment, accessories and wiring systems.
3 Check and finalise design.	3.1 Design is checked by means of established procedures for compliance with all relevant requirements.
	3.2 Design is submitted for appropriate organizational approval and, where applicable, statutory or regulatory approval.
	3.3 Approved copies of design documents are issued for retention in the verification dossier in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing explosion-protected electrical systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM05 Hazardous area electrical systems design 8A

Evidence shall show an understanding of hazardous area electrical systems design to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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REQUIRED SKILLS AND KNOWLEDGE

protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Interpretation of documents showing the classification of a hazardous area encompassing:

- the methods used for classifying hazardous areas;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from similar situations previously classified, such as those given in Standards; and
- situations where classification needs to be undertaken by a person competent in

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non-specific area classification i.e. a person who has attained either Units UEENEEM052A/UEENEEM053A Classify hazardous areas – gas atmospheres or dust atmospheres.

T18 Selecting and checking equipment, wiring and accessories encompassing:

- the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
- explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
- wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
- earthing and equipotential bonding requirements for a hazardous area installation;
- procedures used to check the compliance certification of equipment used in a hazardous area; and
- electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.

T19 Documentation of hazardous area installation design encompassing:

- the items that should be included in the documentation for the design of a hazardous area installation;
- installation layout, specification, work schedule and other documentation required for inclusion in a verification dossier; and
- the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/ accessories.

T20 Common and specific hazardous areas for which classification examples are given in Standards encompassing:

- The example classifications given in Standards
- application of the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

T21 Process for establishing a design brief for an explosion-protected electrical system encompassing:

- consultation processes for establishing client requirements and preparing a design brief; and
- system requirements using site and plant specifications, hazardous area classifications and organization requirements.

T22 System design encompassing:

- major considerations influencing explosion-protected electrical system designs;
- requirements in Standards and regulations that affect the electrical system

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design; and

- typical design process incorporating explosion-protection in an electrical system.

T23 Design documentation required for a hazardous area encompassing:

- procedures for checking and approval of explosion-protected system design; and
- requirements for documenting a final design including documents to be included in a verification dossier.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design explosion-protected electrical systems as described in 8) and including:

    A Accessing and interpreting relevant information.

    B Providing design options and justifications including hazard risk, functionality and economic considerations.

    C Following checking and documentation procedures.

    D Applying relevant contingency management skills.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing explosion-protected electrical systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competencies in designing electrical systems.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM059A Design explosion-protected electrical systems and installations - pressurisation

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG130A Design switchboards rated for high fault levels (greater than 400 A)	
4	Update		Update recommended pre-requisite UEENEEI123A Design electronic control systems	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of designing electrical power, control and instrumentation systems and installations. It requires the ability to establish design briefs and to pursue economical and effective design solutions.

This unit is directly equivalent to the Unit *2.18 Design explosion-protected electrical systems and installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering design job function at, at least, an engineering associate level.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competency in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to):

UEENEEE015B	Develop design briefs for electrotechnology projects

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Prerequisite Unit(s) **2)**

UEENEEG 130A	Design switchboards rated for high fault levels (greater than 400 A)
UEENEEI1 23A	Design electronic control systems

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish design brief.	1.1	Site and plant specifications are obtained and reviewed to establish the system requirements.
	1.2	Classification of the area is obtained from the hazardous area layout drawings or other classification documents.
	1.3	Organizational policies and specifications for hazardous area electrical systems are obtained or established with the appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA
2 Design system and installation.	2.1 Safety, functional and economic considerations are incorporated in system design.
	2.2 Design complies with all hazardous area requirements and includes specifications and all other necessary documentation for explosion-protected equipment, accessories and wiring systems.
3 Check and finalise design.	3.1 Design is checked by means of established procedures for compliance with all relevant requirements.
	3.2 Design is submitted for appropriate organizational approval and, where applicable, statutory or regulatory approval.
	3.3 Approved copies of design documents are issued for retention in the verification dossiers in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing explosion-protected electrical systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM05 Hazardous area electrical systems design 9A

Evidence shall show an understanding of hazardous area electrical systems design to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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REQUIRED SKILLS AND KNOWLEDGE

techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Interpretation of documents showing the classification of a hazardous area encompassing:

- the methods used for classifying hazardous areas;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from similar situations previously classified, such as those given in Standards; and
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REQUIRED SKILLS AND KNOWLEDGE

non-specific area classification i.e. a person who has attained either Units UEENEEM052A/UEENEEM053A Classify hazardous areas – gas atmospheres or dust atmospheres.

T18 Selecting and checking equipment, wiring and accessories encompassing:

- the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
- explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
- wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
- earthing and equipotential bonding requirements for a hazardous area installation;
- procedures used to check the compliance certification of equipment used in a hazardous area; and
- electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.

T19 Documentation of hazardous area installation design encompassing:

- the items that should be included in the documentation for the design of a hazardous area installation;
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- The example classifications given in Standards
- application of the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

T21 Process for establishing a design brief for an explosion-protected electrical system encompassing:

- consultation processes for establishing client requirements and preparing a design brief; and
- system requirements using site and plant specifications, hazardous area classifications and organization requirements.

T22 System design encompassing:

- major considerations influencing explosion-protected electrical system designs;
- requirements in Standards and regulations that affect the electrical system

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REQUIRED SKILLS AND KNOWLEDGE

design; and

- typical design process incorporating explosion-protection in an electrical system.

T23 Design documentation required for a hazardous area encompassing:

- procedures for checking and approval of explosion-protected system design; and
- requirements for documenting a final design including documents to be included in a verification dossier.

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Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

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Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design explosion-protected electrical systems as described in 8) and including:

    A Accessing and interpreting relevant information.

    B Providing design options and justifications including hazard risk, functionality and economic considerations.

    C Following checking and documentation procedures.

    D Applying relevant contingency management skills.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing explosion-protected electrical systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competencies in designing electrical systems.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area and the Pressurisation (Ex 'p') explosion-protection technique.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM060A Carry out overhaul and repair of explosion-protected equipment - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG129A Overhaul and repair major switchgear and controlgear	
4	Update		Update recommended pre-requisite UEENEEG164A Repair and maintain mechanical components of electrical machines	
4	Update		Update recommended prerequisite MEM07001B Perform operational maintenance of machines/equipment	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment at a craftsperson level. It requires the ability to identify and select authorized components, follow repair specifications to effect the overhauled/repaired of equipment and complete repair documentation.

This unit is directly equivalent to the Unit *2.20 Carry out overhaul and repair of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to in electrical, electronic, and/or mechanical equipment repair job function. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in general electrical, electronic, and/or mechanical equipment repair job function at AQF 3or higher. Examples are (but not limited to):

UEENEEG Overhaul and repair major switchgear and

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Prerequisite Unit(s) **2)**

129A	controlgear
UEENEEG 164A	Repair and maintain mechanical components of electrical machines
MEM07001 B	Perform operational maintenance of machines/equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for overhaul/repair of equipment	1.1	Specifications and instructions for the overhaul/repair work are received and expected outcomes of the work confirmed with the responsible person*.
	1.2	Equipment to be overhauled or repaired is identified by its markings and certification documentation.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Special tools, equipment and testing devices needed to carry out the overhaul or repair work are obtained and checked for correct operation, safety and currency of calibration certification.
2	Carry out the overhaul or repair work	2.1	OHS policies and procedures for carrying out the overhaul/repair are followed.
		2.2	Specifications and instructions for the overhaul/repair work are followed in accordance with established procedures.
		2.3	Replacement parts and components used in the overhaul or repair are identified as being authorized by the equipment manufacturer.
		2.4	Overhaul/repair of equipment is done in a manner that does not reduce the type of protection afforded by the equipment design.
		2.5	Quality checks are made to ensure that the overhaul/repair of the equipment complies with the overhaul/repair specifications and instruction.
3	Document overhaul/repair work	3.1	Overhaul/repair work carried out is documented in accordance with established quality procedures.
		3.2	The responsible person* is notified of the completion of the work in accordance with established quality procedures.

* A responsible person, in this context, is a person who has achieved the Competency Standard Units UEENEEM031A to UEENEEM034A

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and

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REQUIRED SKILLS AND KNOWLEDGE

testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM060 Explosion-protected equipment repair A

Evidence shall show an understanding of explosion-protected equipment repair to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling,

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REQUIRED SKILLS AND KNOWLEDGE

and enclosure entries).

- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic

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REQUIRED SKILLS AND KNOWLEDGE

safety;

- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Identifying equipment from its marking and certification documentation.

    B Checking for correct operation, safety and currency of calibration certification.

    C Following overhaul/repair specifications and instructions.

    D Identifying replacement parts and components as being authorized by the equipment manufacturer.

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EVIDENCE GUIDE

E Documenting overhaul/repair work.

F Using quality systems.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any prerequisite unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to overhaul of equipment incorporating all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')

Note: 'I' signifies Group I equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM061A Carry out overhaul and repair of explosion-protected equipment - flameproof enclosures

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG129A Overhaul and repair major switchgear and controlgear	
4	Update		Update recommended pre-requisite UEENEEG164A Repair and maintain mechanical components of electrical machines	
4	Update		Update recommended prerequisite MEM07001B Perform operational maintenance of machines/equipment	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment at a craftsperson level. It requires the ability to identify and select authorized components, follow repair specifications to effect the overhauled/repaired of equipment and complete repair documentation.

This unit is directly equivalent to the Unit *2.20 Carry out overhaul and repair of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to in electrical, electronic, and/or mechanical equipment repair job function. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit do not require a license to practice in the work place for equipment that is disconnected from electrical supply. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in general electrical, electronic, and/or mechanical equipment repair job function at AQF 3or higher. Examples are (but not limited to):

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Prerequisite Unit(s) **2)**

UEENEEG129A	Overhaul and repair major switchgear and controlgear
UEENEEG164A	Repair and maintain mechanical components of electrical machines
MEM07001B	Perform operational maintenance of machines/equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for overhaul/repair of equipment	1.1	Specifications and instructions for the overhaul/repair work are received and expected outcomes of the work confirmed with the responsible person*.
	1.2	Equipment to be overhauled or repaired is identified by its markings and certification documentation.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Special tools, equipment and testing devices needed to carry out the overhaul or repair work are obtained and checked for correct operation, safety and currency of calibration certification.
2	Carry out the overhaul or repair work	2.1	OHS policies and procedures for carrying out the overhaul/repair are followed.
		2.2	Specifications and instructions for the overhaul/repair work are followed in accordance with established procedures.
		2.3	Replacement parts and components used in the overhaul or repair are identified as being authorized by the equipment manufacturer.
		2.4	Overhaul/repair of equipment is done in a manner that does not reduce the type of protection afforded by the equipment design.
		2.5	Quality checks are made to ensure that the overhaul/repair of the equipment complies with the overhaul/repair specifications and instruction.
3	Document overhaul/repair work	3.1	Overhaul/repair work carried out is documented in accordance with established quality procedures.
		3.2	The responsible person* is notified of the completion of the work in accordance with established quality procedures.

* A responsible person, in this context, is a person who has achieved the Competency Standard Units UEENEEM031A to UEENEEM034A

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and

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REQUIRED SKILLS AND KNOWLEDGE

testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM061 A Explosion-protected equipment repair

Evidence shall show an understanding of explosion-protected equipment repair to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling,

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REQUIRED SKILLS AND KNOWLEDGE

and enclosure entries).

- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic

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REQUIRED SKILLS AND KNOWLEDGE

safety;

- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Identifying equipment from its marking and certification documentation.

    B Checking for correct operation, safety and currency of calibration certification.

    C Following overhaul/repair specifications and instructions.

    D Identifying replacement parts and components as being authorized by the equipment manufacturer.

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EVIDENCE GUIDE

E Documenting overhaul/repair work.

F Using quality systems.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any prerequisite unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation flameproof (Ex 'p') explosion-protection technique enclosures only.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM062A Carry out overhaul and repair of explosion-protected equipment - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG129A Overhaul and repair major switchgear and controlgear	
4	Update		Update recommended pre-requisite UEENEEG164A Repair and maintain mechanical components of electrical machines	
4	Update		Update recommended prerequisite MEM07001B Perform operational maintenance of machines/equipment	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment at a craftsperson level. It requires the ability to identify and select authorized components, follow repair specifications to effect the overhauled/repaired of equipment and complete repair documentation.

This unit is directly equivalent to the Unit *2.20 Carry out overhaul and repair of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to in electrical, electronic, and/or mechanical equipment repair job function. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit do not require a license to practice in the work place for equipment that is disconnected from electrical supply. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in general electrical, electronic, and/or mechanical equipment repair job function at AQF 3 or higher. Examples are (but not limited to):

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Prerequisite Unit(s) **2)**

UEENEEG 129A	Overhaul and repair major switchgear and controlgear
UEENEEG 164A	Repair and maintain mechanical components of electrical machines
MEM07001 B	Perform operational maintenance of machines/equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for overhaul/repair of equipment	1.1	Specifications and instructions for the overhaul/repair work are received and expected outcomes of the work confirmed with the responsible person*.
	1.2	Equipment to be overhauled or repaired is identified by its markings and certification documentation.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Special tools, equipment and testing devices needed to carry out the overhaul or repair work are obtained and checked for correct operation, safety and currency of calibration certification.
2	Carry out the overhaul or repair work	2.1	OHS policies and procedures for carrying out the overhaul/repair are followed.
		2.2	Specifications and instructions for the overhaul/repair work are followed in accordance with established procedures.
		2.3	Replacement parts and components used in the overhaul or repair are identified as being authorized by the equipment manufacturer.
		2.4	Overhaul/repair of equipment is done in a manner that does not reduce the type of protection afforded by the equipment design.
		2.5	Quality checks are made to ensure that the overhaul/repair of the equipment complies with the overhaul/repair specifications and instruction.
3	Document overhaul/repair work	3.1	Overhaul/repair work carried out is documented in accordance with established quality procedures.
		3.2	The responsible person* is notified of the completion of the work in accordance with established quality procedures.

* A responsible person, in this context, is a person who has achieved the Competency Standard Units UEENEEM031A to UEENEEM034A

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and

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REQUIRED SKILLS AND KNOWLEDGE

testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM06 Explosion-protected equipment repair 2A

Evidence shall show an understanding of explosion-protected equipment repair to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling,

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REQUIRED SKILLS AND KNOWLEDGE

and enclosure entries).

- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic

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safety;

- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Identifying equipment from its marking and certification documentation.

    B Checking for correct operation, safety and currency of calibration certification.

    C Following overhaul/repair specifications and instructions.

    D Identifying replacement parts and components as being authorized by the equipment manufacturer.

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EVIDENCE GUIDE

E Documenting overhaul/repair work.

F Using quality systems.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any prerequisite unit.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to overhaul of equipment incorporating all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')
- Pressurisation (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM063A Carry out overhaul and repair of explosion-protected equipment - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG129A Overhaul and repair major switchgear and controlgear	
4	Update		Update recommended pre-requisite UEENEEG164A Repair and maintain mechanical components of electrical machines	
4	Update		Update recommended prerequisite MEM07001B Perform operational maintenance of machines/equipment	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment at a craftsperson level. It requires the ability to identify and select authorized components, follow repair specifications to effect the overhauled/repaired of equipment and complete repair documentation.

This unit is directly equivalent to the Unit *2.20 Carry out overhaul and repair of explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to in electrical, electronic, and/or mechanical equipment repair job function. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit do not require a license to practice in the work place for equipment that is disconnected from electrical supply. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in general electrical, electronic, and/or mechanical equipment repair job function at AQF 3 or higher. Examples are (but not limited to):

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Prerequisite Unit(s) **2)**

UEENEEG 129A	Overhaul and repair major switchgear and controlgear
UEENEEG 164A	Repair and maintain mechanical components of electrical machines
MEM07001 B	Perform operational maintenance of machines/equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for overhaul/repair of equipment	1.1	Specifications and instructions for the overhaul/repair work are received and expected outcomes of the work confirmed with the responsible person*.
	1.2	Equipment to be overhauled or repaired is identified by its markings and certification documentation.

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ELEMENT		PERFORMANCE CRITERIA	
		1.3	Special tools, equipment and testing devices needed to carry out the overhaul or repair work are obtained and checked for correct operation, safety and currency of calibration certification.
2	Carry out the overhaul or repair work	2.1	OHS policies and procedures for carrying out the overhaul/repair are followed.
		2.2	Specifications and instructions for the overhaul/repair work are followed in accordance with established procedures.
		2.3	Replacement parts and components used in the overhaul or repair are identified as being authorized by the equipment manufacturer.
		2.4	Overhaul/repair of equipment is done in a manner that does not reduce the type of protection afforded by the equipment design.
		2.5	Quality checks are made to ensure that the overhaul/repair of the equipment complies with the overhaul/repair specifications and instruction.
3	Document overhaul/repair work	3.1	Overhaul/repair work carried out is documented in accordance with established quality procedures.
		3.2	The responsible person* is notified of the completion of the work in accordance with established quality procedures.

* A responsible person, in this context, is a person who has achieved the Competency Standard Units UEENEEM031A to UEENEEM034A

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and

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REQUIRED SKILLS AND KNOWLEDGE

testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM063A Explosion-protected equipment repair

Evidence shall show an understanding of explosion-protected equipment repair to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties

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REQUIRED SKILLS AND KNOWLEDGE

Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.

- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

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REQUIRED SKILLS AND KNOWLEDGE

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Ltions of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9**.**1**) Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably

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EVIDENCE GUIDE

gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Identifying equipment from its marking and certification documentation.

    B Checking for correct operation, safety and currency of calibration certification.

    C Following overhaul/repair specifications and instructions.

    D Identifying replacement parts and components as being authorized by the equipment manufacturer.

    E Documenting overhaul/repair work.

    F Using quality systems.

    G Applying relevant contingency management skills.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any prerequisite unit.

Range Statement

RANGE STATEMENT

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RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to overhaul of equipment incorporating all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM064A Conduct audit of hazardous areas installations - coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG131A Evaluate performance of low voltage electrical apparatus	
4	Update		Update recommended pre-requisite UEENEEG160A Evaluate performance of LV electrical machines	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of conducting an audit of an electrical installation. It requires the ability to verify whether an installation complies with the relevant hazardous areas Standards for that installation and includes the verification of design and certification documentation (verification dossier), maintenance, overhaul and repair, work safety, inspection against Standards and reporting of audit results.

This unit is directly equivalent to the Unit *2.21* Conduct *audit of hazardous areas installations* in the Australian/New Zealand Standard *AS*/*NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering inspection/quality assurance job function and regulatory inspections. It is suitable for employment-based programs.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in engineering auditing/evaluation AQF 5 or equivalent. Examples are (but not limited to):

UEENEEG 131A	Evaluate performance of low voltage electrical apparatus

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Prerequisite Unit(s) **2)**

UEENEEG 160A	Evaluate performance of LV electrical machines

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Audit hazardous areas documentation (verification dossier) and prepare to audit as-built installation	1.1	Records system (verification dossier) is reviewed to verify that essential hazardous areas documentation is retained and procedures for maintaining records are established.
	1.2	Hazardous areas classification and design drawings and documentation are checked to verify that appropriate procedures have been followed and are checked for traceability and authentication.
	1.3	Type and intended location of each item of equipment and circuits subject to audit are determined from design drawings and

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ELEMENT	PERFORMANCE CRITERIA	
		documentation.
	1.4	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.5	Where applicable, appropriately qualified persons are engaged to assist in aspects of the audit process.
	1.6	Special tools, equipment and devices needed for the audit are obtained and checked for correct operation and safety.
2 Conduct audit	2.1	OHS policies and procedures for working in a hazardous area are followed.
	2.2	Parts of equipment that are dismantled in order to conduct the audit are protected against loss or damage.
	2.3	Appropriately qualified persons are directed to access components of the installation as required to audit the installation.
	2.4	Equipment, systems and installations are audited for conformance with the design specifications retained in the hazardous areas documentation (verification dossier) and in accordance with requirements of the applicable Standards.
3 Report audit results	3.1	Differences between the hazardous areas documentation (verification dossier), including the design specifications and installation, are recorded.
	3.2	Any non-conformances are documented in accordance with established procedures.
	3.3	Documentation in relation to all aspects of the audit is forwarded to the appropriate personnel for any actions identified and for inclusion in the hazardous areas verification dossier. Note: This includes any conformity assessment and fitness-for-purpose assessment.

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ELEMENT	PERFORMANCE CRITERIA
	3.4 Where applicable, actions to be taken under a regulatory audit in relation to non-conformances are documented and forwarded to appropriate personnel.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM06 Hazardous areas installation auditing 4A

Evidence shall show an understanding of hazardous areas installation auditing to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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REQUIRED SKILLS AND KNOWLEDGE

protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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REQUIRED SKILLS AND KNOWLEDGE

techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Processes used in auditing hazardous areas encompassing:

- Requirements to retain hazardous areas documentation on site.
- Components of an audit:
  - authenticity of documentation;
  - hazardous areas delineations shown in site diagrams;
  - location and operating parameters of equipment shown in certification documents;
  - compliance of equipment location;

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REQUIRED SKILLS AND KNOWLEDGE

- compliance of wiring systems; and
- alignment of hazardous areas documentation to as- built installation.
- Reporting non-conformance of an installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Working safety in a hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation.

    B Reviewing hazardous areas documentation and identifying the extent of the audit.

    C Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.

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EVIDENCE GUIDE

D Engaging and directing appropriately qualified persons as required.

E Conducting audit to industry Standards.

F Identifying any non-conforming aspects of the installation.

G Reporting non-conforming aspects of the installation affecting safety.

H Documenting audit outcomes.

I Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with competencies in engineering auditing/evaluation.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')

Note: 'I' signifies Group I equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM065A Conduct audit of hazardous areas installations - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG131A Evaluate performance of low voltage electrical apparatus	
4	Update		Update recommended pre-requisite UEENEEG160A Evaluate performance of LV electrical machines	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of conducting an audit of an electrical installation. It requires the ability to verify whether an installation complies with the relevant hazardous areas Standards for that installation and includes the verification of design and certification documentation (verification dossier), maintenance, overhaul and repair, work safety, inspection against Standards and reporting of audit results.

This unit is directly equivalent to the Unit *2.21* Conduct *audit of hazardous areas installations* in the Australian/New Zealand Standard *AS*/*NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering inspection/quality assurance job function and regulatory inspections. It is suitable for employment-based programs.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in engineering auditing/evaluation AQF 5 or equivalent. Examples are (but not limited to):

UEENEEG131A	Evaluate performance of low voltage electrical apparatus

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Prerequisite Unit(s)	**2)**
	OR
	UEENEEG060B Evaluate performance of LV electrical machines

Employability Skills Information

Employability Skills	**3**)
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Audit hazardous areas documentation (verification dossier) and prepare to audit as-built installation	1.1	Records system (verification dossier) is reviewed to verify that essential hazardous areas documentation is retained and procedures for maintaining records are established.
	1.2	Hazardous areas classification and design drawings and documentation are checked to verify that appropriate procedures have been followed and are checked for traceability and authentication.
	1.3	Type and intended location of each item of

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ELEMENT		PERFORMANCE CRITERIA	
			equipment and circuits subject to audit are determined from design drawings and documentation.
		1.4	OHS policies and procedures for preparing to work in a hazardous area are followed.
		1.5	Where applicable, appropriately qualified persons are engaged to assist in aspects of the audit process.
		1.6	Special tools, equipment and devices needed for the audit are obtained and checked for correct operation and safety.
2	Conduct audit	2.1	OHS policies and procedures for working in a hazardous area are followed.
		2.2	Parts of equipment that are dismantled in order to conduct the audit are protected against loss or damage.
		2.3	Appropriately qualified persons are directed to access components of the installation as required to audit the installation.
		2.4	Equipment, systems and installations are audited for conformance with the design specifications retained in the hazardous areas documentation (verification dossier) and in accordance with requirements of the applicable Standards.
3	Report audit results	3.1	Differences between the hazardous areas documentation (verification dossier), including the design specifications and installation, are recorded.
		3.2	Any non-conformances are documented in accordance with established procedures.
		3.3	Documentation in relation to all aspects of the audit is forwarded to the appropriate personnel for any actions identified and for inclusion in the hazardous areas documentation (verification dossier). Note: This includes any conformity assessment and

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ELEMENT	PERFORMANCE CRITERIA	
		fitness-for-purpose assessment.
	3.4	Where applicable, actions to be taken under a regulatory audit in relation to non-conformances are documented and forwarded to appropriate personnel.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM065 Hazardous areas installation auditing A

Evidence shall show an understanding of hazardous areas installation auditing to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Processes used in auditing hazardous areas encompassing:

- Requirements to retain hazardous areas documentation on site.
- Components of an audit:
  - authenticity of documentation;
  - hazardous areas delineations shown in site diagrams;
  - location and operating parameters of equipment shown in certification documents;
  - compliance of equipment location;

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- compliance of wiring systems; and
- alignment of hazardous areas documentation to as- built installation.
- Reporting non-conformance of an installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Working safety in a hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation.

    B Reviewing hazardous areas documentation and identifying the extent of the audit.

    C Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.

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EVIDENCE GUIDE

D Engaging and directing appropriately qualified persons as required.

E Conducting audit to industry Standards.

F Identifying any non-conforming aspects of the installation.

G Reporting non-conforming aspects of the installation affecting safety.

H Documenting audit outcomes.

I Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with competencies in engineering auditing/evaluation.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM066A Conduct audit of hazardous areas installations - dust atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG131A Evaluate performance of low voltage electrical apparatus	
4	Update		Update recommended pre-requisite UEENEEG160A Evaluate performance of LV electrical machines	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of conducting an audit of an electrical installation. It requires the ability to verify whether an installation complies with the relevant hazardous areas Standards for that installation and includes the verification of design and certification documentation (verification dossier), maintenance, overhaul and repair, work safety, inspection against Standards and reporting of audit results.

This unit is directly equivalent to the Unit *2.21* Conduct *audit of hazardous areas installations* in the Australian/New Zealand Standard *AS*/*NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering inspection/quality assurance job function and regulatory inspections. It is suitable for employment-based programs.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in engineering auditing/evaluation AQF 5 or equivalent. Examples are (but not limited to):

UEENEEG 131A	Evaluate performance of low voltage electrical apparatus

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Prerequisite Unit(s) **2)**

OR

UEENEEG 160A	Evaluate performance of LV electrical machines

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Audit hazardous areas documentation (verification dossier) and prepare to audit as-built installation	1.1	Records system (verification dossier) is reviewed to verify that essential hazardous areas documentation is retained and procedures for maintaining records are established.
	1.2	Hazardous areas classification and design drawings and documentation are checked to verify that appropriate procedures have been followed and are checked for traceability and authentication.
	1.3	Type and intended location of each item of

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ELEMENT		PERFORMANCE CRITERIA	
			equipment and circuits subject to audit are determined from design drawings and documentation.
		1.4	OHS policies and procedures for preparing to work in a hazardous area are followed.
		1.5	Where applicable, appropriately qualified persons are engaged to assist in aspects of the audit process.
		1.6	Special tools, equipment and devices needed for the audit are obtained and checked for correct operation and safety.
2	Conduct audit	2.1	OHS policies and procedures for working in a hazardous area are followed.
		2.2	Parts of equipment that are dismantled in order to conduct the audit are protected against loss or damage.
		2.3	Appropriately qualified persons are directed to access components of the installation as required to audit the installation.
		2.4	Equipment, systems and installations are audited for conformance with the design specifications retained in the hazardous areas documentation (verification dossier) and in accordance with requirements of the applicable Standards.
3	Report audit results	3.1	Differences between the hazardous areas documentation (verification dossier), including the design specifications and installation, are recorded.
		3.2	Any non-conformances are documented in accordance with established procedures.
		3.3	Documentation in relation to all aspects of the audit is forwarded to the appropriate personnel for any actions identified and for inclusion in the hazardous areas documentation (verification dossier). Note: This includes any conformity assessment and

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ELEMENT	PERFORMANCE CRITERIA	
		fitness-for-purpose assessment.
	3.4	Where applicable, actions to be taken under a regulatory audit in relation to non-conformances are documented and forwarded to appropriate personnel.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM06 Hazardous areas installation auditing 6A

Evidence shall show an understanding of hazardous areas installation auditing to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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REQUIRED SKILLS AND KNOWLEDGE

techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Processes used in auditing hazardous areas encompassing:

- Requirements to retain hazardous areas documentation on site.
- Components of an audit:
  - authenticity of documentation;
  - hazardous areas delineations shown in site diagrams;
  - location and operating parameters of equipment shown in certification documents;
  - compliance of equipment location;

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REQUIRED SKILLS AND KNOWLEDGE

- compliance of wiring systems; and
- alignment of hazardous areas documentation to as- built installation.
- Reporting non-conformance of an installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Working safety in a hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation.

    B Reviewing hazardous areas documentation and identifying the extent of the audit.

    C Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.

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EVIDENCE GUIDE

D Engaging and directing appropriately qualified persons as required.

E Conducting audit to industry Standards.

F Identifying any non-conforming aspects of the installation.

G Reporting non-conforming aspects of the installation affecting safety.

H Documenting audit outcomes.

I Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment	**9**.**4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9**.**5**) For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with competencies in engineering auditing/evaluation.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM067A Assess the fitness-for-purpose of hazardous areas explosion-protected equipment - coal mining

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of permanently installed explosion-protected equipment, which has no acceptable certification and a conformity assessment document cannot be prepared to determine the level of conformity with current IEC or AS/NZS Standards. It requires the ability to gather, establish and evaluate technical information on relevant explosion-protection techniques and to report evaluations and findings, including recommendations based on safety requirements and economic considerations.

This unit is directly equivalent to the Unit *2.22 Assess the fitness-for-purpose of hazardous areas explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to safety, maintenance and engineering design and management job functions. The unit is intended to be restricted to :

- end users when considering the use and

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Application of the Unit **4**)

refurbishment of legacy plant; and

- selecting repaired or overhauled equipment.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after competency in the following units:

UEENEEM035A	Conduct a conformity assessment of explosion-protected equipment coal mining
UEENEEM043A	Conduct detailed inspection of hazardous areas installations coal mining
UEENEEM064A	Conduct audit of hazardous areas installations coal mining

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Employability Skills Information

Employability Skills	**3**)
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assess fitness-for-purpose of equipment and systems	1.1	OHS policies and procedures are followed.
	1.2	Equipment or system to be assessed is ascertained from instructions and in consultation with appropriate personnel.
	1.3	Available design documentation in accordance with established procedures is obtained from site records or equipment/system manufacturer.
	1.4	Authenticity of documentation is verified with the issuing organization or the assessor.
	1.5	Appropriate Standards and codes of practice against which equipment or systems are to be assessed are determined, obtained and understood.
	1.6	Where design documentation is unavailable arrangements are made to establish the specification of the equipment to determine the normal operating and performance parameters of

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ELEMENT		PERFORMANCE CRITERIA	
			the equipment or system.
		1.7	Special tools, equipment and testing devices needed to carry out field testing/measurements are obtained and checked for correct operation and safety.
2	Gather technical information to assess fitness-for-purpose of equipment and systems	2.1	OHS policies and procedures for working in a hazardous area are followed.
		2.2	Where necessary tests/measurements are carried out to verify the specification for the equipment or system.
		2.3	Assessment of the equipment or system is made to gather data relevant to the specification and verified according to the appropriate Standards and Codes of Practice.
3	Assess equipment/systems against Standards	3.1	Equipment/system design details are assessed for compliance with each relevant clause in the appropriate Standard. Examination is set up in accordance with established procedures.
		3.2	Differences between the equipment and Standards requirements are identified and documented.
		3.3	Recommendations are developed as to whether remedial work is viable for equipment or systems that are not initially assessed as fit-for-purpose.
		3.4	Specifications are recommended for the remediation of equipment or systems to be suitable as fit-for-purpose are developed.
4	Develop and submit a fitness-for-purpose report	4.1	Assessment results pertaining to the integrity of explosion-protected electrical equipment are documented in a fitness-for-purpose report in accordance with requirements and established procedures.
		4.2	Fitness-for-purpose report and all required appended documentation are forwarded in accordance with requirements and established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM067 Explosion-protected equipment fitness-for-purpose A

Evidence shall show an understanding of explosion-protected equipment fitness-for-purpose to an extent indicated by the following aspects:

T1 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T2 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T3 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

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REQUIRED SKILLS AND KNOWLEDGE

T4 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T5 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T6 The relationship between the documentation held in a verification dossier and the installed equipment encompassing:

- consistency between the location and type of equipment with the area classification details in the verification dossier; and
- equipment certification and any attached conditions that relate to the equipment as it is installed.

T7 Inspecting a hazardous area installation encompassing:

- typical processes for undertaking the inspection of a hazardous area installation;
- requirements applicable to a given installation; and
- reporting of an inspection of a hazardous area installation.

T8 Documentation used in assessing explosion-protected equipment for conformance to accepted Standards encompassing:

- The documentation and Standard(s) required to begin an assessment.
- The differences between the test requirements of Standards from other countries and the compliant/acceptable Standards against which the equipment is being assessed.
- Results given in equipment test reports.
- Conformity assessment processes and procedures.

T9 Assessing to a current acceptable Standard existing equipment that has been certified to previously acceptable Standards encompassing:

- processes and procedures used; and
- possible outcomes.

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REQUIRED SKILLS AND KNOWLEDGE

T10 A clause by clause assessment between the equipment manufacturing Standard(s) and the current acceptable Ex Standards encompassing:

- processes and procedures used; and
- differences between the Standards that may be detected.

T11 Techniques used in fitness-for purpose assessment of equipment for use in hazardous areas encompassing:

- Processes for verifying that a design specification meets the integrity of the equipment, showing the equipment is fit-for-purpose and is safe to use:
  - Standards against which fitness-for-purpose assessment is made;
  - the need to maintain the accuracy/calibration of measuring/test devices/tools;
  - assessment and measurements/tests requirements for determining that an item of explosion-protected equipment complies with the relevant Standards and meets the certification requirements;
  - testing that is/is not required to determine compliance of the equipment being assessed; and
  - development of different tests to those given in Standards and justification as to how they achieve the same result.
  - Typical specification for the equipment to be assessed as fit-for-purpose.

T12 Processes used in auditing hazardous areas encompassing:

- Requirements to retain hazardous areas documentation on site.
- Components of an audit:
  - authenticity of documentation;
  - hazardous areas delineations shown in site diagrams;
  - location and operating parameters of equipment shown in certification documents;
  - compliance of equipment location;
  - compliance of wiring systems; and
  - alignment of hazardous areas documentation to as- built installation.
- Reporting non-conformance of an installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Following OHS procedures.

    B Obtaining and authenticating equipment specification and performance documentation.

    C Obtaining appropriate Standards and codes.

    D Carrying out appropriate measurements/tests accurately and safety.

    E Developing a design specification that accurately

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EVIDENCE GUIDE

reflects the function and operation of the equipment or system.

F Assessing equipment/system for compliance with each relevant clause of the appropriate Standard.

G Identifying differences between design details and Standards.

H Making decisions on the viability of remedial work that are supportable on safety and economic grounds.

I Developing clear specifications for acceptable remedial work.

J Writing a fitness-for-purpose report that includes all required elements and appended documents.

K Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following units:

UEENEEM064A Conduct audit of hazardous areas installations coal mining

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')

Note: 'I' signifies Group I equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM068A Assess the fitness-for-purpose of hazardous areas explosion-protected equipment - gas atmospheres

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of permanently installed explosion-protected equipment, which has no acceptable certification and a conformity assessment document cannot be prepared to determine the level of conformity with current IEC or AS/NZS Standards. It requires the ability to gather, establish and evaluate technical information on relevant explosion-protection techniques and to report evaluations and findings, including recommendations based on safety requirements and economic considerations.

This unit is directly equivalent to the Unit *2.22 Assess the fitness-for-purpose of hazardous areas explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to safety, maintenance and engineering design and management job functions. The unit is intended to be restricted to :

- end users when considering the use and

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Application of the Unit **4**)

refurbishment of legacy plant; and

- selecting repaired or overhauled equipment.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after competency in the following units:

UEENEEM036A	Conduct a conformity assessment of explosion-protected equipment - gas atmospheres
UEENEEM044A	Conduct detailed inspection of hazardous areas installations - gas atmospheres
UEENEEM065A	Conduct audit of hazardous areas installations - gas atmospheres

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Employability Skills Information

Employability Skills	**3**)
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assess fitness-for-purpose of equipment and systems	1.1	OHS policies and procedures are followed.
	1.2	Equipment or system to be assessed is ascertained from instructions and in consultation with appropriate personnel.
	1.3	Available design documentation in accordance with established procedures is obtained from site records or equipment/system manufacturer.
	1.4	Authenticity of documentation is verified with the issuing organization or the assessor.
	1.5	Appropriate Standards and codes of practice against which equipment or systems are to be assessed are determined, obtained and understood.
	1.6	Where design documentation is unavailable

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ELEMENT		PERFORMANCE CRITERIA	
			arrangements are made to establish the specification of the equipment to determine the normal operating and performance parameters of the equipment or system.
		1.7	Special tools, equipment and testing devices needed to carry out field testing/measurements are obtained and checked for correct operation and safety.
2	Gather technical information to assess fitness-for-purpose of equipment and systems	2.1	OHS policies and procedures for working in a hazardous area are followed.
		2.2	Where necessary tests/measurements are carried out to verify the specification for the equipment or system.
		2.3	Assessment of the equipment or system is made to gather data relevant to the specification and verified according to the appropriate Standards and Codes of Practice.
3	Assess equipment/systems against Standards	3.1	Equipment/system design details are assessed for compliance with each relevant clause in the appropriate Standard. Examination is set up in accordance with established procedures.
		3.2	Differences between the equipment and Standards requirements are identified and documented.
		3.3	Recommendations are developed as to whether remedial work is viable for equipment or systems that are not initially assessed as fit-for-purpose.
		3.4	Specifications are recommended for the remediation of equipment or systems to be suitable as fit-for-purpose are developed.
4	Develop and submit a fitness-for-purpose report	4.1	Assessment results pertaining to the integrity of explosion-protected electrical equipment are documented in a fitness-for-purpose report in accordance with requirements and established procedures.
		4.2	Fitness-for-purpose report and all required appended documentation are forwarded in accordance with requirements and established

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ELEMENT	PERFORMANCE CRITERIA
	procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM068 Explosion-protected equipment fitness-for-purpose A

Evidence shall show an understanding of explosion-protected equipment fitness-for-purpose to an extent indicated by the following aspects:

T1 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T2 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T3 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including

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REQUIRED SKILLS AND KNOWLEDGE

certification documentation.

T4 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T5 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T6 The relationship between the documentation held in a verification dossier and the installed equipment encompassing:

- consistency between the location and type of equipment with the area classification details in the verification dossier; and
- equipment certification and any attached conditions that relate to the equipment as it is installed.

T7 Inspecting a hazardous area installation encompassing:

- typical processes for undertaking the inspection of a hazardous area installation;
- requirements applicable to a given installation; and
- reporting of an inspection of a hazardous area installation.

T8 Documentation used in assessing explosion-protected equipment for conformance to accepted Standards encompassing:

- The documentation and Standard(s) required to begin an assessment.
- The differences between the test requirements of Standards from other countries and the compliant/acceptable Standards against which the equipment is being assessed.
- Results given in equipment test reports.
- Conformity assessment processes and procedures.

T9 Assessing to a current acceptable Standard existing equipment that has been certified to previously acceptable Standards encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- processes and procedures used; and
- possible outcomes.

T10 A clause by clause assessment between the equipment manufacturing Standard(s) and the current acceptable Ex Standards encompassing:

- processes and procedures used; and
- differences between the Standards that may be detected.

T11 Techniques used in fitness-for purpose assessment of equipment for use in hazardous areas encompassing:

- Processes for verifying that a design specification meets the integrity of the equipment, showing the equipment is fit-for-purpose and is safe to use:
  - Standards against which fitness-for-purpose assessment is made;
  - the need to maintain the accuracy/calibration of measuring/test devices/tools;
  - assessment and measurements/tests requirements for determining that an item of explosion-protected equipment complies with the relevant Standards and meets the certification requirements;
  - testing that is/is not required to determine compliance of the equipment being assessed; and
  - development of different tests to those given in Standards and justification as to how they achieve the same result.
  - Typical specification for the equipment to be assessed as fit-for-purpose.

T12 Processes used in auditing hazardous areas encompassing:

- Requirements to retain hazardous areas documentation on site.
- Components of an audit:
  - authenticity of documentation;
  - hazardous areas delineations shown in site diagrams;
  - location and operating parameters of equipment shown in certification documents;
  - compliance of equipment location;
  - compliance of wiring systems; and
  - alignment of hazardous areas documentation to as- built installation.
- Reporting non-conformance of an installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Following OHS procedures.

    B Obtaining and authenticating equipment specification and performance documentation.

    C Obtaining appropriate Standards and codes.

    D Carrying out appropriate measurements/tests accurately and safety.

    E Developing a design specification that accurately

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reflects the function and operation of the equipment or system.

F Assessing equipment/system for compliance with each relevant clause of the appropriate Standard.

G Identifying differences between design details and Standards.

H Making decisions on the viability of remedial work that are supportable on safety and economic grounds.

I Developing clear specifications for acceptable remedial work.

J Writing a fitness-for-purpose report that includes all required elements and appended documents.

K Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following units:

UEENEEM065A Conduct audit of hazardous areas installations gas atmospheres

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.**2**) **Literacy and numeracy skills**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM069A Assess the fitness-for-purpose of hazardous areas explosion-protected equipment - dust atmospheres

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This Competency Standard Unit covers the explosion-protection aspects of permanently installed explosion-protected equipment, which has no acceptable certification and a conformity assessment document cannot be prepared to determine the level of conformity with current IEC or AS/NZS Standards. It requires the ability to gather, establish and evaluate technical information on relevant explosion-protection techniques and to report evaluations and findings, including recommendations based on safety requirements and economic considerations.

This unit is directly equivalent to the Unit *2.22 Assess the fitness-for-purpose of hazardous areas explosion-protected equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to safety, maintenance and engineering design and management job functions. The unit is intended to be restricted to :

- end users when considering the use and

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Application of the Unit **4**)

refurbishment of legacy plant; and

- selecting repaired or overhauled equipment.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after competency in the following units:

UEENEEM037A	Conduct a conformity assessment of explosion-protected equipment - dust atmospheres
UEENEEM045A	Conduct detailed inspection of hazardous areas installations - dust atmospheres
UEENEEM066A	Conduct audit of hazardous areas installations - dust atmospheres

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Employability Skills Information

Employability Skills	**3**)
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assess fitness-for-purpose of equipment and systems	1.1	OHS policies and procedures are followed.
	1.2	Equipment or system to be assessed is ascertained from instructions and in consultation with appropriate personnel.
	1.3	Available design documentation in accordance with established procedures is obtained from site records or equipment/system manufacturer.
	1.4	Authenticity of documentation is verified with the issuing organization or the assessor.
	1.5	Appropriate Standards and codes of practice against which equipment or systems are to be assessed are determined, obtained and understood.
	1.6	Where design documentation is unavailable

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ELEMENT		PERFORMANCE CRITERIA	
			arrangements are made to establish the specification of the equipment to determine the normal operating and performance parameters of the equipment or system.
		1.7	Special tools, equipment and testing devices needed to carry out field testing/measurements are obtained and checked for correct operation and safety.
2	Gather technical information to assess fitness-for-purpose of equipment and systems	2.1	OHS policies and procedures for working in a hazardous area are followed.
		2.2	Where necessary tests/measurements are carried out to verify the specification for the equipment or system.
		2.3	Assessment of the equipment or system is made to gather data relevant to the specification and verified according to the appropriate Standards and Codes of Practice.
3	Assess equipment/systems against Standards	3.1	Equipment/system design details are assessed for compliance with each relevant clause in the appropriate Standard. Examination is set up in accordance with established procedures.
		3.2	Differences between the equipment and Standards requirements are identified and documented.
		3.3	Recommendations are developed as to whether remedial work is viable for equipment or systems that are not initially assessed as fit-for-purpose.
		3.4	Specifications are recommended for the remediation of equipment or systems to be suitable as fit-for-purpose are developed.
4	Develop and submit a fitness-for-purpose report	4.1	Assessment results pertaining to the integrity of explosion-protected electrical equipment are documented in a fitness-for-purpose report in accordance with requirements and established procedures.
		4.2	Fitness-for-purpose report and all required appended documentation are forwarded in accordance with requirements and established

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ELEMENT	PERFORMANCE CRITERIA
	procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM069A Explosion-protected equipment fitness-for-purpose

Evidence shall show an understanding of explosion-protected equipment fitness-for-purpose to an extent indicated by the following aspects:

T1 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T2 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T3 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

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REQUIRED SKILLS AND KNOWLEDGE

T4 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T5 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T6 The relationship between the documentation held in a verification dossier and the installed equipment encompassing:

- consistency between the location and type of equipment with the area classification details in the verification dossier; and
- equipment certification and any attached conditions that relate to the equipment as it is installed.

T7 Inspecting a hazardous area installation encompassing:

- typical processes for undertaking the inspection of a hazardous area installation;
- requirements applicable to a given installation; and
- reporting of an inspection of a hazardous area installation.

T8 Documentation used in assessing explosion-protected equipment for conformance to accepted Standards encompassing:

- The documentation and Standard(s) required to begin an assessment.
- The differences between the test requirements of Standards from other countries and the compliant/acceptable Standards against which the equipment is being assessed.
- Results given in equipment test reports.
- Conformity assessment processes and procedures.

T9 Assessing to a current acceptable Standard existing equipment that has been certified to previously acceptable Standards encompassing:

- processes and procedures used; and

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REQUIRED SKILLS AND KNOWLEDGE

- possible outcomes.

T10 A clause by clause assessment between the equipment manufacturing Standard(s) and the current acceptable Ex Standards encompassing:

- processes and procedures used; and
- differences between the Standards that may be detected.

T11 Techniques used in fitness-for purpose assessment of equipment for use in hazardous areas encompassing:

- Processes for verifying that a design specification meets the integrity of the equipment, showing the equipment is fit-for-purpose and is safe to use:
  - Standards against which fitness-for-purpose assessment is made;
  - the need to maintain the accuracy/calibration of measuring/test devices/tools;
  - assessment and measurements/tests requirements for determining that an item of explosion-protected equipment complies with the relevant Standards and meets the certification requirements;
  - testing that is/is not required to determine compliance of the equipment being assessed; and
  - development of different tests to those given in Standards and justification as to how they achieve the same result.
  - Typical specification for the equipment to be assessed as fit-for-purpose.

T12 Processes used in auditing hazardous areas encompassing:

- Requirements to retain hazardous areas documentation on site.
- Components of an audit:
  - authenticity of documentation;
  - hazardous areas delineations shown in site diagrams;
  - location and operating parameters of equipment shown in certification documents;
  - compliance of equipment location;
  - compliance of wiring systems; and
  - alignment of hazardous areas documentation to as- built installation.
- Reporting non-conformance of an installation.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Following OHS procedures.

    B Obtaining and authenticating equipment specification and performance documentation.

    C Obtaining appropriate Standards and codes.

    D Carrying out appropriate measurements/tests accurately and safety.

    E Developing a design specification that accurately

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reflects the function and operation of the equipment or system.

F Assessing equipment/system for compliance with each relevant clause of the appropriate Standard.

G Identifying differences between design details and Standards.

H Making decisions on the viability of remedial work that are supportable on safety and economic grounds.

I Developing clear specifications for acceptable remedial work.

J Writing a fitness-for-purpose report that includes all required elements and appended documents.

K Applying relevant contingency management skills.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following units:

UEENEEM066A Conduct audit of hazardous areas installations dust atmospheres

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to classified dust hazardous area and all the following explosion-protection techniques:

- Intrinsic safety, (Ex 'i')
- Protection by enclosure-dusts, (Ex 't')
- Pressurization, (Ex 'p')

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM070A Repair reeling, trailing and flexible cables

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This Competency Standard Unit covers sheathing, insulation and conductor repair of reeling, trailing and flexible cables. It requires the ability to work safely and to Standards, follow repair instructions, apply repair techniques and document the repair work.

This unit is directly equivalent to the Unit *2.23 Repair reeling, trailing and flexible cables* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Note:

Although this unit is primarily intended for the repair of cable types specified by AS/NZS 1802 and AS/NZS 2802 and used in mining, it may be applied to the repair of other similar cables.

Application of the Unit

Application of the Unit **4**)

This unit applies to mining cable and associated equipment overhaul and repair job functions at AQF 2 level or higher. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisites specified for this unit; however, competencies in general overhaul or repair work would assist in achieving this unit.

Employability Skills Information

Employability Skills **3)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair cable	1.1	OHS policies and procedures for entering a work site are followed.
	1.2	Cable to be repaired and repair specifications are confirmed with appropriate personnel.
	1.3	Materials required for the repair are obtained in accordance with established procedures.
	1.4	Special tools, equipment and testing devices needed to carry out the repair work are obtained and checked for correct operation, safety and currency of calibration certification.
2 Carry out cable repair	2.1	OHS policies and procedures for carrying out cable repair are followed.
	2.2	Specifications and instructions for the cable repair are followed in accordance with established procedures.
	2.3	Damaged cable material is removed and cables appropriately prepared for joining.
	2.4	An acceptable method is applied to splicing and joining conductors.
	2.5	Insulation and covering is replaced on all cores and out sheath correctly using appropriate materials.
	2.6	An acceptable method is used to join pliable cable armour.
	2.7	Cable sheath is repaired using the appropriate sheath tape and vulcanised at the required temperature and time to ensure as new electrical and mechanical properties are retained.
	2.8	Cable repair is done in a manner that does not reduce the operating parameters for the cable type.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and document cable repair work	3.1	OHS policies and procedures for completing cables repair work are followed.
	3.2	Cable repair work carried out is documented in accordance with established quality procedures.
	3.3	Appropriate personnel are notified of the completion of the work in accordance with established quality procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM07 Ex reeling cable repairs 0A

Evidence shall show an understanding of Ex reeling cable repairs to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Cable types encompassing:

- cable construction, materials and design features;
- function of each design feature;
- conditions under which cables should be stored;
- Standards to which cables are manufactured; and
- typical applications.

T6 Cable repair preparation and conductor splicing methods encompassing:

- criteria for determining the section of cable suitable to be joined;
- cable preparation and methods; and
- splicing methods and application for power, pilot and earthing conductors.

T7 Replacement of cable insulation encompassing:

- preparation of a power conductors prior to the application of insulation;

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- types of insulation repair tapes and their application; and
- techniques for applying insulation repair tape.

T8 Techniques for joining pliable wire armour.

T9 Replacing and repairing cable sheath encompassing:

- techniques used in replacing cable sheath;
- setting up a vulcanizer to vulcanize a repair; and
- vulcanizing techniques and issues.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Repairing at least four separate cables as described in 8) and including:

    A Following OHS procedures.

    B Confirming cable repair specifications.

    C Correctly preparing a cable joint.

    D Applying an acceptable conductor splicing method correctly.

    E Insulating and covering all cores and outer sheath

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EVIDENCE GUIDE

correctly, using appropriate materials.

F Applying an acceptable for joining pliable cable armour correctly.

G Preparing and vulcanising cable sheath to the required hardness.

H Documenting cable repair in accordance with established quality procedures.

I Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) No units applicable.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to repairing at least four separate cables. Among the four cables for which competency is demonstrated, all of the following features shall be included:

Cable features	**AS/NZS designated cable type**
Standard conductor construction	209; 210; 240; 241; 260; 275; 409; 412.1; 440; 441.1; 441; 450; 455.
Super flexible	245.
HV-EP-90 insulated	441; 450; 455.
Semi conductive extruded screens	241; 245; 441.1; 441; 450; 455.
Metal braided screens	209; 210; 240; 260; 409; 440; 450.
Interstitial earths	241; 245; 275; 412.1; 441.1; 441; 450; 455.
Interstitial pilots	240; 260; 440; 450; 455.
Central pilot	209; 210; 241; 245; 275; 409; 441.1; 441.
Pliable armour	260; 412.1.
Sheath reinforcement	241; 245; 274; 441.1; 441; 450; 455.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5)**

Hazards

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UEENEEM071A Test reeling, trailing and flexible cables

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This Competency Standard Unit covers the pre and post repair testing of reeling, trailing and flexible cables. It requires the ability to work safely and to Standards, evaluate the condition of cables, conduct cable tests, write repair specifications, and document test results and cable repair history.

This unit is directly equivalent to the Unit *2.24 Test reeling, trailing and flexible cables* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Note:

Although this unit is primarily intended for the repair of cable types specified by AS/NZS 1802 and AS/NZS 2802 and used in mining, it may be applied to the repair of other similar cables.

Application of the Unit

Application of the Unit **4**)

This unit applies to mining cable and associated equipment overhaul and repair job functions at AQF 3 level or higher. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisites specified for this unit; however, competencies in compliance, testing and inspection of general overhaul or repair work would assist in achieving this unit.

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to test cables	1.1	OHS policies and procedures for entering a work site are followed.
	1.2	Cable to be repaired is confirmed with appropriate personnel and the cable type is identified.
	1.3	Cable history test records are reviewed to identify potential issues and ascertain the viability of repair.
	1.4	Materials required for the repair are obtained in accordance with established procedures.
	1.5	Special tools, equipment and testing devices needed to carry out the tests are obtained and checked for correct operation, safety and currency of calibration certification.

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ELEMENT	PERFORMANCE CRITERIA	
2 Specify the extent of cable repair required	2.1	OHS policies and procedures for inspecting and testing cables are followed.
	2.2	Cable testing devices are handled carefully and set up correctly prior to each test.
	2.3	Cables are inspected and tested to ascertain the viability of repairs or extent of repairs required.
	2.4	Viability or extent of the cable repair is determined from inspection/test results and cable repair history records.
	2.5	Specifications and instructions for the cable repair are documented in accordance with established procedures.
	2.6	Appropriate personnel are notified of the cable repair work required in accordance with established quality procedures.
3 Test repaired cable	3.1	OHS policies and procedures for testing cables are followed.
	3.2	Knowledge of cable design parameters and how they are tested/measured are applied to cable testing.
	3.3	Cable testing devices handled carefully and set up correctly prior to each test.
	3.4	Each test reading is taken accurately and recorded in accordance with established procedures.
	3.5	Actions in accordance with established procedures are taken to rectify any non-conformance shown by test results.
4 Document cable tests	4.1	OHS policies and procedures for completing cables tests are followed.
	4.2	Cable history test records are updated in accordance with established quality procedures.
	4.3	In accordance with established quality procedures appropriate personnel are notified of the completion of the work and provided with

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ELEMENT	PERFORMANCE CRITERIA
	copies of the documents.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM071 A Ex reeling cable repair - testing

Evidence shall show an understanding of Ex reeling cable repairs testing to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Cable types encompassing:

- cable construction, materials and design features;
- function of each design feature;
- conditions under which cables should be stored;
- Standards to which cables are manufactured; and
- typical applications.

T6 Cable repair preparation and conductor splicing methods encompassing:

- criteria for determining the section of cable suitable to be joined;
- cable preparation and methods; and
- splicing methods and application for power, pilot and earthing conductors.

T7 Replacement of cable insulation encompassing:

- preparation of a power conductors prior to the application of insulation;

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REQUIRED SKILLS AND KNOWLEDGE

- types of insulation repair tapes and their application; and
- techniques for applying insulation repair tape.

T8 Techniques for joining pliable wire armour.

T9 Replacing and repairing cable sheath encompassing:

- techniques used in replacing cable sheath;
- setting up a vulcanizer to vulcanize a repair; and
- vulcanizing techniques and issues.

T10 Electrical fundamentals and testing techniques encompassing:

- Nature of electrical current and charge.
- Sources of electricity.
- Effects of current.
- Single-source single-load circuits — components that make up the circuit;
- the relationship between voltage and current.
  - Consequences of a short-circuit and an open-circuit.
- Insulation materials and properties; and types and applications in cable technology.
- Conducting materials, properties; factor affecting resistance;
- types and applications in cable technology.
- Semiconducting materials and semiconducting properties;
- types and applications in cable technology.
  - Electrical parameters of cables and their measurement.
  - Care and handling of testing devices and requirement of measuring instruments to have current calibration certification.
  - Types of devices used for testing cables.

T11 Testing design parameters of cables and cable assemblies encompassing—

- causes of inaccuracies and overcoming them;
- test device set up and safety procedures;
- interpreting test readings; and
- test results that show a cable complies with the Standards requirements.

NOTE: Cable tests include continuity, phase rotation, insulation resistance, high-voltage proof test, partial break test, symmetrical load test and sheath hardness tests.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Pre and post repair testing of at least four separate cables as described in 8) and including:

    A Following OHS procedures.

    B Ascertaining the viability of repair appropriately.

    C Specifying cable repairs required from inspection/test results and cable repair history records.

    D Setting up and using cable testing devices correctly.

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EVIDENCE GUIDE

E Performing and recording all required tests accurately.

F Documenting cable testing, including updating history records in accordance with established quality procedures.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

No units applicable.

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other units

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to pre and post repair testing of at least four separate cables. Among the four cables for which competency is demonstrated, all of the following features shall be included:

Cable features	**AS/NZS designated cable type**
Standard conductor construction	209; 210; 240; 241; 260; 275; 409; 412.1; 440; 441.1; 441; 450; 455.
Super flexible	245.
HV-EP-90 insulated	441; 450; 455.
Semi conductive extruded screens	241; 245; 441.1; 441; 450; 455.
Metal braided screens	209; 210; 240; 260; 409; 440; 450.
Interstitial earths	241; 245; 275; 412.1; 441.1; 441; 450; 455.
Interstitial pilots	240; 260; 440; 450; 455.
Central pilot	209; 210; 241; 245; 275; 409; 441.1; 441.
Pliable armour	260; 412.1.
Sheath reinforcement	241; 245; 274; 441.1; 441; 450; 455.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM072A Inspect and fit plugs/couplers for reeling, trailing and flexible cables

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This Competency Standard Unit covers the inspection, component replacement and fitting of plugs/couplers on reeling, trailing and flexible cables. It requires the ability to work safely and to Standards, to evaluate the condition of the plugs/couplers, to identify correct core and pin configurations, to apply repair techniques and to document repair/replacement work.

This unit is directly equivalent to the Unit *2.25 Inspect and fit plugs/couplers for reeling, trailing and flexible cables* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Note:

Although this unit is primarily intended for the repair of cable types specified by AS/NZS 1802 and AS/NZS 2802 and used in mining, it may be applied to the repair of other similar cables.

Application of the Unit

Application of the Unit **4**)

This unit applies to mining cable and associated equipment overhaul and repair job functions at AQF 3 level or higher. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisites specified for this unit; however, competencies in general overhaul or repair work would assist in achieving this unit.

Employability Skills Information

Employability Skills **3)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to repair cable	1.1	OHS policies and procedures for entering a work site are followed.
		1.2	Cable to be repaired is confirmed with appropriate personnel and the cable type is identified.
		1.3	Cable plugs/couplers are identified by marking and explosion-protection certification documentation.
		1.4	Materials required for the repair are obtained in accordance with established procedures.
		1.5	Special tools, equipment and testing devices needed to carry out the plugs/couplers work are obtained and checked for correct operation and safety.
2	Inspect and fit plugs/couplers	2.1	OHS policies and procedures for inspecting and fitting plugs and couplers are followed.
		2.2	Plugs/couplers are inspected for damage to housings, pins and sockets and defects to any explosion-protection part/component.
		2.3	Arrangements are made for repair or replacement of damaged or defective parts/components.
		2.4	Replacement parts/components are identified as being authorized by the plugs/couplers manufacturer.
		2.5	Correct phasing for voltage, current and pin configurations are identified.
		2.6	Cable cores are prepared and terminated to correct length using relevant soldering or crimping methods.
		2.7	Cable is prepared and terminated in plug and coupler ensuring correct termination length, sheath protrusion and clamping and creepage and clearances are maintained.

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ELEMENT	PERFORMANCE CRITERIA	
	2.8	Cable tails, leads and terminations are inspected to ensure they are correct and sound.
3 Complete and document cable repair work	3.1	OHS policies and procedures for completing plugs/couplers repair work are followed.
	3.2	Plugs/couplers repair work carried out is documented in accordance with established quality procedures.
	3.3	Appropriate personnel are notified of the completion of the work in accordance with established quality procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM072 A Ex reeling cable repair - plugs/couplings and inspection

Evidence shall show an understanding of Ex reeling cable repair - plugs/couplings and inspection to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

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REQUIRED SKILLS AND KNOWLEDGE

T10 Enclosures for dusts (Ex 'tD') - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T11 Common characteristics of explosion-protection techniques encompassing:

- The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q', ventilation Ex 'v' and special protection Ex 's').
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T12 Reeling, trailing and flexible cable plug and coupler inspection and fitting techniques encompassing:

- Types of plugs and couplers.
- Inspection process and techniques:-
  - parts of plug and couplers that are required to be inspected;
  - inspection procedures; and
  - condition of each part effecting fitness for service.
- Fitting processes and techniques:-
  - factors affecting the correct fitting of plug and coupler;
  - cable preparation requirements and techniques; and
  - conductor termination methods and techniques.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Inspecting and fitting of plugs/couplers to four cables as described in 8) and including:

    A Following OHS procedures.

    B Identifying plugs/couplers by marking and explosion-protection certification documentation.

    C Identifying and ascertaining the condition of plugs/couplers correctly.

    D Identifying replacement parts/components as being authorized by the plugs/couplers manufacturer.

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EVIDENCE GUIDE

E Fitting plugs/couplers with correct phasing and maintaining the integrity of the explosion-protection techniques.

F Documenting plugs/couplers repair in accordance with established quality procedures.

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with

9.5)

No units applicable.

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EVIDENCE GUIDE

other units

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency in this unit shall be demonstrated in relation to inspecting and fitting of plugs/couplers certified for each explosion-protection technique of flameproof (Ex 'd'), increased safety (Ex 'e') intrinsically safe (Ex 'i') and encapsulation-dusts (Ex 'mD'). Among the four cables for which competency is demonstrated all of the following features shall be included:

Cable features	**AS/NZS designated cable type**
Standard conductor construction	209; 210; 240; 241; 260; 275; 409; 412.1; 440; 441.1; 441; 450; 455.
Super flexible	245.
HV-EP-90 insulated	441; 450; 455.
Semi conductive extruded screens	241; 245; 441.1; 441; 450; 455.
Metal braided screens	209; 210; 240; 260; 409; 440; 450.
Interstitial earths	241; 245; 275; 412.1; 441.1; 441; 450; 455.
Interstitial pilots	240; 260; 440; 450; 455.
Central pilot	209; 210; 241; 245; 275; 409; 441.1; 441.
Pliable armour	260; 412.1.
Sheath reinforcement	241; 245; 274; 441.1; 441; 450; 455.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

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Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM073A Verify compliance of repaired reeling, trailing and flexible cables

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This Competency Standard Unit covers compliance verification of repaired and tested reeling, trailing and flexible cables and their plugs/couplers assemblies by a responsible person. It requires the ability to work safely and to Standards, evaluate repairs against required standard and to maintain required repair records.

This unit is directly equivalent to the Unit *2.26 Verify compliance of repaired reeling, trailing and flexible cables* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Note:

Although this unit is primarily intended for the repair of cable types specified by AS/NZS 1802 and AS/NZS 2802 and used in mining, it may be applied to the repair of other similar cables.

Application of the Unit

Application of the Unit **4**)

This unit applies to mining cable and associated equipment overhaul and repair job functions at AQF 3 level or higher. It is suitable for employment-based programs under an approved contract of training.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEM070A	Repair reeling, trailing and flexible cable
UEENEEM071A	Test reeling, trailing and flexible cables
UEENEEM072A	Inspect and fit plugs/couplers for reeling, trailing and flexible cables

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to verify compliance of repaired cables	1.1	OHS policies and procedures for entering a work site are followed.
	1.2	Specifications and instructions for cable repair are received and expected outcomes of the work confirmed with appropriate personnel.
	1.3	Cable history test records are reviewed to identify potential issues and ascertain the viability of repair.
	1.4	Certification documentation for plugs/couplers are sought and received in order to check that the equipment complies with the certification.
	1.5	Tools, equipment and testing devices needed to verify compliance are obtained and checked for correct operation, safety and currency of calibration certification.

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ELEMENT		PERFORMANCE CRITERIA	
2	Carry out verification of compliance	2.1	OHS policies and procedures for carrying out verification are followed.
		2.2	Documentation of pre and post repair test results are compared with requirements of compliance standards.
		2.3	Compliance verification measurements, tests and inspections carried out on the repair cable and fitted plugs/couplers assemblies are in accordance with OHS and other established procedures.
		2.4	Actions are taken to have any non-compliance shown by measurements, tests and inspections results rectified in accordance with established procedures.
3		3.1	OHS policies and procedures for completing verification work are followed.
		3.2	Verification of compliance is documented, including update of cable test history records in accordance with established quality procedures.
	Complete and document cable repair work	3.3	Verification of compliance is issued to the appropriate persons in accordance with established quality procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM073 A Ex reeling cable repair - verification

Evidence shall show an understanding of Ex reeling cable repair - verification to an extent indicated by the following aspects:

T1 Cable types encompassing:

- cable construction, materials and design features;
- function of each design feature;
- conditions under which cables should be stored;
- Standards to which cables are manufactured; and
- typical applications.

T2 Cable repair preparation and conductor splicing methods encompassing:

- criteria for determining the section of cable suitable to be joined;
- cable preparation and methods; and
- splicing methods and application for power, pilot and earthing conductors.

T3 Replacement of cable insulation encompassing:

- preparation of a power conductors prior to the application of insulation;
- types of insulation repair tapes and their application; and
- techniques for applying insulation repair tape.

T4 Techniques for joining pliable wire armour.

T5 Replacing and repairing cable sheath encompassing:

- techniques used in replacing cable sheath;
- setting up a vulcanizer to vulcanize a repair; and
- vulcanizing techniques and issues.

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REQUIRED SKILLS AND KNOWLEDGE

T6 Electrical fundamentals and testing techniques encompassing:

- Nature of electrical current and charge.
- Sources of electricity.
- Effects of current.
- Single-source single-load circuits — components that make up the circuit;
- the relationship between voltage and current.
  - Consequences of a short-circuit and an open-circuit.
- Insulation materials and properties; and types and applications in cable technology.
- Conducting materials, properties; factor affecting resistance;
- types and applications in cable technology.
- Semiconducting materials and semiconducting properties;
- types and applications in cable technology.
  - Electrical parameters of cables and their measurement.
  - Care and handling of testing devices and requirement of measuring instruments to have current calibration certification.
  - Types of devices used for testing cables.

T7 Testing design parameters of cables and cable assemblies encompassing—

- causes of inaccuracies and overcoming them;
- test device set up and safety procedures;
- interpreting test readings; and
- test results that show a cable complies with the Standards requirements.

NOTE: Cable tests include continuity, phase rotation, insulation resistance, high-voltage proof test, partial break test, symmetrical load test and sheath hardness tests.

T8 Reeling, trailing and flexible cable plug and coupler inspection and fitting techniques encompassing:

- Types of plugs and couplers.
- Inspection process and techniques:-
  - parts of plug and couplers that are required to be inspected;
  - inspection procedures; and
  - condition of each part effecting fitness for service.
- Fitting processes and techniques:-
  - factors affecting the correct fitting of plug and coupler;
  - cable preparation requirements and techniques; and
  - conductor termination methods and techniques.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - as described in 8) and including:

    A Following OHS procedures.

    B Reviewing and ascertaining the viability of repair.

    C Confirming expected outcomes of the repair work.

    D Comparing pre and post repair test results with requirements of compliance standards.

    E Carrying out compliance measurements, tests and inspections correctly and safely.

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EVIDENCE GUIDE

F Identifying non-compliance aspects of repaired cable and plugs/couplers assemblies from pre and post repair test results and compliance measurements, tests and inspections.

G Documenting and issuing verification of compliance in accordance with established quality procedures.

H Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing installations in hazardous areas.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any of the following units:

UEENEEM070A Repair reeling, trailing and flexible cables

UEENEEM071A Test reeling, trailing and flexible cables

UEENEEM072A Inspect and fit plugs/couplers for reeling, trailing and flexible cables

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency in this unit shall be demonstrated in relation to compliance verification of the repair of at least four separate cables, including the fitting of the plugs/couplers certified for each explosion-protection technique of flameproof (Ex 'd'), increased safety (Ex 'e'), intrinsically safe (Ex 'i') and encapsulation-dusts (Ex 'mD'). Among the four cables for which competency is demonstrated, all of the following features shall be included:

Cable features	**AS/NZS designated cable type**
Standard conductor construction	209; 210; 240; 241; 260; 275; 409; 412.1; 440; 441.1; 441; 450; 455.
Super flexible	245.
HV-EP-90 insulated	441; 450; 455.
Semi conductive extruded screens	241; 245; 441.1; 441; 450; 455.
Metal braided screens	209; 210; 240; 260; 409; 440; 450.
Interstitial earths	241; 245; 275; 412.1; 441.1; 441; 450; 455.
Interstitial pilots	240; 260; 440; 450; 455.
Central pilot	209; 210; 241; 245; 275; 409; 441.1; 441.
Pliable armour	260; 412.1.
Sheath reinforcement	241; 245; 274; 441.1; 441; 450; 455.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM074A Plan electrical installations in hazardous areas - Coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG125A Plan electrical installations with a low voltage demand up to 400 A per phase	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects planning electrical installations for hazardous areas It requires the ability to identify hazardous area zones from classification diagrams or from examples of previously classified areas or those given in standards, and to select and locate explosion-protected equipment and wiring systems and other items that may influence the explosion-protection technique.

This unit is directly equivalent to the Unit *2.17 Plan electrical installations for hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication design job functions.

Note:
Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM023A	Install explosion-protected equipment and wiring systems coal mining

OR

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Prerequisite Unit(s) **2)**

Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent. Examples are (but not limited to):

UEENEEG125A	Plan electrical installations with a low voltage demand up to 400 A per phase
UEENEEI112A	Verify compliance and functionality of instrumentation and control installations

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Verify hazardous classification for the area.	1.1 Nature and characteristics of explosion hazards in the area are identified from plant specifications.
	1.2 In the absence of classification documentation, arrangements are made to ensure the explosion hazard in the area is assessed and the area

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ELEMENT		PERFORMANCE CRITERIA	
			classified.
		1.3	Classification, extent of zonings of the area, gas groups and temperature class are verified by reference to classification documents or Standards in which the explosion hazard, area classification and zonings are clearly identified.
2	Select and check equipment, wiring and accessories.	2.1	Equipment and accessories are selected to suit area activities and comply with explosion-protection requirements.
		2.2	Wiring systems are selected to suit area activities, and comply with explosion-protection, load and duty requirements.
		2.3	Equipment compliance certification is checked for suitability for the area classification and zonings.
		2.4	Cables and accessories are checked for suitability for the area classification and zonings and load and duty requirements.
3	Document installation plan.	3.1	Installation specifications are documented in accordance with established procedures and requirements.
		3.2	Arrangements are made to file as-built installation documentation in the verification dossier in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing electrical installations in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM074 Hazardous areas electrical installation planning A

Evidence shall show an understanding of hazardous areas electrical installation planning to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Cable termination types suitable for use in hazardous areas encompassing:

- Explosion protection features of cable terminations devices.
- Selecting compliant cable termination devices.

T18 Interpretation of documents showing the classification of a hazardous area encompassing:

- the methods used for classifying hazardous areas;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;

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- the delineation of zones, temperature classes and gas groups of a given hazardous area from similar situations previously classified, such as those given in Standards; and
- situations where classification needs to be undertaken by a person competent in non-specific area classification i.e. a person who has attained either Units UEENEEM052A/UEENEEM053A Classify hazardous areas – gas atmospheres or dust atmospheres.

T19 Selecting and checking equipment, wiring and accessories encompassing:

- the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
- explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
- wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
- earthing and equipotential bonding requirements for a hazardous area installation;
- procedures used to check the compliance certification of equipment used in a hazardous area; and
- electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.

T20 Documentation of hazardous area installation design encompassing:

- the items that should be included in the documentation for the design of a hazardous area installation;
- installation layout, specification, work schedule and other documentation required for inclusion in a verification dossier; and
- the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/ accessories.

T21 Common and specific hazardous areas for which classification examples are given in Standards encompassing:

- The example classifications given in Standards
- application of the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design electrical installations in hazardous areas as described in 8) and including:

    A Interpreting area classification documentation or Standards

    B Documenting area classification.

    C Selecting equipment for a given classified area.

    D Selecting wiring systems for a given classified area

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EVIDENCE GUIDE

E Checking equipment certification for suitability for a given classified area

F Documenting as-built installation

G Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing electrical installations in hazardous areas.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently any of the following unit:

UEENEEM023A Install explosion-protected equipment and wiring systems coal mining
OR
Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')
- Note 'I' signifies Group I equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these

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RANGE STATEMENT

and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5)**

Hazards

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UEENEEM075A Design explosion-protected electrical systems - Coal mining

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG130A Design switchboards rated for high fault levels (greater than 400 A)	
4	Update		Update recommended pre-requisite UEENEEI123A Design electronic control systems.	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of designing electrical power, control and instrumentation systems and installations. It requires the ability to establish design briefs and to pursue economical and effective design solutions.

This unit is directly equivalent to the Unit *2.18 Design explosion-protected electrical systems and installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering design job function at, at least, an engineering associate level.

Note:
Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after confirming competency in designing electrical systems and installations at AQF level 6 or equivalent. Examples are (but not limited to):

UEENEEE015B	Develop design briefs for electro technology projects
UEENEEG	Design switchboards rated for high fault

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Prerequisite Unit(s) **2)**

130A	levels (greater than 400 A)
UEENEEI123A	Design electronic control systems.

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish design brief.	1.1	Site and plant specifications are obtained and reviewed to establish the system requirements.
	1.2	Classification of the area is obtained from the hazardous area layout drawings or other classification documents.
	1.3	Organizational policies and specifications for hazardous area electrical systems are obtained or established with the appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA	
2 Design system and installation.	2.1	Safety, functional and economic considerations are incorporated in system design.
	2.2	Design complies with all hazardous area requirements and includes specifications and all other necessary documentation for explosion-protected equipment, accessories and wiring systems.
3 Check and finalise design.	3.1	Design is checked by means of established procedures for compliance with all relevant requirements.
	3.2	Design is submitted for appropriate organizational approval and, where applicable, statutory or regulatory approval.
	3.3	Approved copies of design documents are issued for retention in the verification dossier, in accordance with established procedures and requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing explosion-protected electrical systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM07 Hazardous area electrical systems design 5A

Evidence shall show an understanding of hazardous area electrical systems design to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

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explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

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- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety technique;
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits

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protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

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techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T15 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T16 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T17 Cable termination types suitable for use in hazardous areas encompassing:

- Explosion protection features of cable terminations devices.
- Selecting compliant cable termination devices.

T18 Interpretation of documents showing the classification of a hazardous area encompassing:

- the methods used for classifying hazardous areas;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;

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- the delineation of zones, temperature classes and gas groups of a given hazardous area from similar situations previously classified, such as those given in Standards; and
- situations where classification needs to be undertaken by a person competent in non-specific area classification i.e. a person who has attained either Units UEENEEM052A/UEENEEM053A Classify hazardous areas – gas atmospheres or dust atmospheres.

T19 Selecting and checking equipment, wiring and accessories encompassing:

- the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
- explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
- wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
- earthing and equipotential bonding requirements for a hazardous area installation;
- procedures used to check the compliance certification of equipment used in a hazardous area; and
- electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.

T20 Documentation of hazardous area installation design encompassing:

- the items that should be included in the documentation for the design of a hazardous area installation;
- installation layout, specification, work schedule and other documentation required for inclusion in a verification dossier; and
- the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/ accessories.

T21 Common and specific hazardous areas for which classification examples are given in Standards encompassing:

- The example classifications given in Standards
- application of the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

T22 Process for establishing a design brief for an explosion-protected electrical system encompassing:

- consultation processes for establishing client requirements and preparing a design brief; and
- system requirements using site and plant specifications, hazardous area classifications and organization requirements.

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T23 System design encompassing:

- major considerations influencing explosion-protected electrical system designs;
- requirements in Standards and regulations that affect the electrical system design; and
- typical design process incorporating explosion-protection in an electrical system.

T24 Design documentation required for a hazardous area encompassing:

- procedures for checking and approval of explosion-protected system design; and
- requirements for documenting a final design including documents to be included in a verification dossier.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design explosion-protected electrical systems as described in 8) and including:

    A Accessing and interpreting relevant information.

    B Providing design options and justifications including hazard risk, functionality and economic considerations.

    C Following checking and documentation procedures

    D Applying relevant contingency management skills.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing explosion-protected electrical systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with competencies in designing electrical systems.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')
- Protection by enclosure-dusts, (Ex 't')
- Note 'I' signifies Group I equipment

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM076A Use and maintain the integrity of a portable gas detection device

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the gas detection aspects of ensuring a work place is safe from explosive and toxic gases and vapours. It requires the ability to use measuring instruments accurately, follow written instructions and to write instructions for others.

This unit is directly equivalent to the Unit *2.4 Use and maintain the integrity of portable gas detection devices* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to job function that requires entry to a designated hazardous area to undertake repair, maintenance or construction work at AQF 3 level or higher. It is suitable for employment-based programs under an approved contract of training.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control,

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Application of the Unit **4**)

marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.**2**) **License to practice**

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM080A	Report on the integrity of explosion-protected equipment in a hazardous area

AND

Competencies required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent.

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to use portable gas detection device.	1.1	The need to initiate gas detection is identified by OHS requirements and established procedures.
	1.2	The gas or vapour to be detected is established from plant/site records or consultation with relevant personnel.
	1.3	Gas detection device(s) for the gas/vapour to be detected is/are checked for calibration and response in accordance with manufacturer instructions.
	1.4	Gas detection devices are checked for factors that could nullify the Ex rating. Note: This would include damaged casing, use of incorrect batteries and/or chargers, use of incorrect spare parts and accessories.

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ELEMENT	PERFORMANCE CRITERIA	
2 Establish safety of the area with regards to the presence of gases or vapours.	2.1	OHS policies and procedures relating to gas/vapour detection are followed.
	2.2	Gas detection device is used in accordance with manufacturer instructions and with regards to environmental conditions.
	2.3	Observations of gas detection readings are recorded in accordance with established procedures.
	2.4	Safe-to-work is determined from gas detection reading and then clearance to work is issued in accordance with established procedures.
3 Monitor gas detection devices for the presence of gases/vapours.	3.1	The frequency of monitoring is determined from the nature of gas/vapour and the effect of environmental and local conditions (e.g. ambient temperature rise, density of gas/vapour, flash point, dew point and detector position).
	3.2	Others are instructed in procedures to carry out monitoring and these instructions are documented.
4 Follow procedures to maintain gas detection devices.	4.1	Gas detection devices are stored in accordance with manufacturer recommendations.
	4.2	Gas detection devices are formally checked and calibrated periodically in accordance with established site requirements and instrument accuracy.
	4.3	Storage, use and calibration record of the gas detection devices is maintained, in accordance with the established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and using and maintaining the integrity of portable gas detection devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM07 6A Portable gas detection devices

Evidence shall show an understanding of portable gas detection devices to an extent indicated by the following aspects:

T1 Principles of gas detection and the use and care of portable gas detection devices encompassing:

- Fundamental principles in the use of gas and vapour instruments.
- Use of manufacturer's instruction manual (Instruction manuals include operating instructions, adjustment procedures, operational limitations, and storage).
- Calibration and response checking.

T2 Detecting gases and vapours encompassing:

- apparatus capability and users' knowledge;
- propagation of gases - This includes release of gas and vapours, ventilation, density, temperature and location.
- gases to be detected and not to be detected;
- intended application;
- environmental effects;
- safety when monitoring for flammable gases where personnel could be present;
- common properties of gases and vapours - This includes density of gases, vapours and their mixtures; effect of temperature on density; LEL and UEL of combustibles and toxicity.
- the differences between detecting gases and vapours - These include added complication of evaporation, condensation and temperature effects of vapours and their effect on propagation, calibration and detection, including sampling.

T3 Oxygen deficiency and effects on safety encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- chemical reaction of oxygen with solid products;
- chemical reaction of oxygen with gaseous products; and
- dilution of the air by displacement by some other gas or vapour.

T4 Measuring principles of catalytic sensors, electrochemical sensors, infrared sensors and semi-conductor sensors encompassing:

- common applications;
- limitations and safety;
- interferences of other gases with the measurement; and
- poisoning of the sensor.

NOTE: Detailed information on gas detection is given in AS/NZS 60079.29.2.

T5 Limits of gas detection of flammable (combustible) gas equipment, encompassing—

- limit to which flammable gas detection equipment will only detect gases and vapours that are present in the vicinity of the detector (or in the line of sight of open path apparatus); and
- limit to which flammable gas equipment will not detect combustible liquids as such, or combustible mists, dusts, or fibres.

T6 Limits of vapour detection of flammable (combustible) gas equipment (flammable gas detection equipment will only detect those vapours that do not condense at the temperature of the detector or its sampling equipment).

T7 Interpretation of gas detection instrument readings (behaviour) encompassing:

- upscale reading in the presence of a gas for which an instrument is not calibrated;
- causes of erratic indications;
- reading of low concentrations of gas of interest; and
- off-scale readings.

T8 Toxicity level of flammable gases and vapours and their potential for occurring in a given situation.

T9 Issues with gas and vapour detection in confined spaces.

T10 Use of the manufacturer’s instruction manual (operating instructions, adjustment procedures, operational limitations, storage).

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use and maintain the integrity of portable gas detection devices as described in 8) and including:

    A Following work permits and clearance procedures.

    B Monitoring hazards and following evacuation procedures.

    C Determining whether the gas/vapour level in a work area is safe from explosive, toxic and oxygen deficiency aspects.

    D Following procedures to maintain the integrity of

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EVIDENCE GUIDE

gas detection devices

E Instructing others in the use of a portable gas detection device in relation to a specific activity.

F Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to using and maintaining the integrity of portable gas detection devices.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with the following units

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EVIDENCE GUIDE

UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

and

Competencies required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent chosen as a prerequisite

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area or confined space.

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Custom Content Section

Competency Field **5)**

Hazards

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UEENEEM077A Install and maintain the integrity of fixed gas detection equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the installation, calibration and response checking of permanent gas detection equipment. It requires the ability to match equipment with that specified for a given location and to use manufacturer manuals to maintain accuracy of gas monitoring devices.

This unit is directly equivalent to the Unit *2.6 Install and maintain integrity of fixed gas detection equipment* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication installation and maintenance job functions at AQF 3 level or higher.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and

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Application of the Unit **4**)

petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

UEENEEM023A	Install explosion-protected equipment and wiring systems coal mining

OR

UEENEEM024A	Install explosion-protected equipment and wiring systems gas atmospheres

OR

UEENEEM025A	Install explosion-protected equipment and wiring systems dust atmospheres

OR

UEENEEM027A	Maintain equipment in hazardous areas coal mining

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Prerequisite Unit(s) **2)**

OR

UEENEEM028A	Maintain equipment in hazardous areas gas atmospheres

OR

UEENEEM029A	Maintain equipment in hazardous areas dust atmospheres.

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for installation gas detection equipment.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Location in which gas detection of equipment is to be installed is determined from design documents.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Gas detection equipment markings are checked to ensure they conform to design specifications and certification documents.
	1.4	Certification document supplied with each item of gas detection equipment is collected for inclusion in site records.
2 Install gas detection equipment.	2.1	OHS policies and procedures are followed.
	2.2	Gas detection equipment is installed in appropriate locations and in conformance with design specifications, standards and within the limits specified by the equipment certification and manufacturer.
	2.3	Gas detection is installed in a manner that does not reduce the type of protection afforded by any associated explosion-equipment design.
3 Response checking and calibration of gas detection equipment.	3.1	OHS policies and procedures are followed.
	3.2	Gas detection equipment is formally checked and calibrated periodically in accordance with established site requirements and instrument accuracy.
	3.3	Installation and maintenance of gas detection equipment is documented in accordance with requirements and forwarded to personnel responsible for compiling verification dossier.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining integrity of fixed gas detection equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM077A Gas detection installation and maintenance

Evidence shall show an understanding of gas detection installation and maintenance to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.
- Schemes commonly used in countries other than Australia and New Zealand.
- Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.

T2 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique;
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T3 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Increased safety

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REQUIRED SKILLS AND KNOWLEDGE

technique;

- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T4 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
- Typical situations where the Non-sparking explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Non-sparking technique; and
- The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.

T5 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T6 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T7 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;

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REQUIRED SKILLS AND KNOWLEDGE

- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T8 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’, ventilation Ex ‘v’ and special protection Ex ‘s’).
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

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REQUIRED SKILLS AND KNOWLEDGE

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T15 Techniques for the installation and maintenance of fixed gas detection equipment encompassing:

- Use of manufacturer’s instruction manual; for example, operating instructions, adjustments procedures and operational limitations.
- Installation and maintenance of Standards and/or Codes of Practice for gas detection equipment.

T16 Location of fixed sample points or sensors encompassing:

- optimal sensing;
- maintainability and ease of calibration; and
- protection against environmental and mechanical damage.

T17 Gas and vapour releases encompassing—

- the nature of a site; and
- natural and mechanical ventilation.

T18 Common problems with fixed gas detectors.

T19 Calibration and response checking.

T20 Factors to consider in the evaluation and selection of portable and fixed gas

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REQUIRED SKILLS AND KNOWLEDGE

detection equipment encompassing:

- Requirements for gas detection for a given situation:
  - sources for obtaining data on physical chemistry of the gas to be detected; and
  - sources for obtaining data on the conditions under which the gas may be present.
  - processes of assessing the specifications of gas detection equipment against established requirements.

T21 Detecting gases and vapours encompassing:

- apparatus capability and users' knowledge;
- propagation of gases - This includes release of gas and vapours, ventilation, density, temperature and location.
- gases to be detected and not to be detected;
- intended application;
- environmental effects;
- safety when monitoring for flammable gases where personnel could be present;
- common properties of gases and vapours - This includes density of gases, vapours and their mixtures; effect of temperature on density; LEL and UEL of combustibles and toxicity.
- the differences between detecting gases and vapours - These include added complication of evaporation, condensation and temperature effects of vapours and their effect on propagation, calibration and detection, including sampling.

T22 Oxygen deficiency and effects on safety encompassing:

- chemical reaction of oxygen with solid products;
- •hemical reaction of oxygen with gaseous products; and
- dilution of the air by displacement by some other gas or vapour.

T23 Measuring principles of catalytic sensors, electrochemical sensors, infrared sensors and semi-conductor sensors encompassing:

- common applications;
- limitations and safety;
- interferences of other gases with the measurement; and
- poisoning of the sensor.

NOTE: Detailed information on gas detection is given in AS/NZS 60079.29.2.

Evidence Guide

EVIDENCE GUIDE

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EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required

9.**2**)

Before the critical aspects of evidence are considered all

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EVIDENCE GUIDE

to demonstrate competency in this unit

prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain integrity of fixed gas detection equipment as described in 8) and including:

    A Working safely in a potentially hazardous area or confined space including the use of work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation

    B Handling and installing equipment and wiring in a manner that does not reduce the integrity afforded by the equipment design

    C Checking equipment against certification documents and design specifications

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EVIDENCE GUIDE

D Documenting installation and maintenance activities

E Following procedures to maintain the integrity of gas detection

F Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and maintaining integrity of fixed gas detection equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with any

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EVIDENCE GUIDE

prerequisite unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques specified for at least one of the prerequisites.

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM078A Manage compliance of hazardous areas

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of ensuring that potentially explosive atmospheres, generated by production, processing or servicing activities, do not pose a hazard to persons, property or the environment.

This unit is directly equivalent to the Unit *2.14 Manage compliance of hazardous areas* in the Australian/New Zealand Standard *AS*/*NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to job functions that incorporate responsibility for a hazardous area, such as a plant manager or owner of a business who has a hazardous area within their business premises.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in general plant management at AQF 4 Example are (but not limited to):

PMASUP41 Develop plant documentation.
0A

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish possibility of explosive hazard.	1.1	Competent person or persons are engaged to provide advice on the nature and extent of any explosive hazard on the site.
	1.2	Measures are taken to ensure explosive hazards are identified and the area classified by competent person or persons in accordance with requirements.
	1.3	Arrangements are made to establish a verification dossier in accordance with requirements.
2 Establish explosion-protection strategies for site.	2.1	Competent person or persons are engaged to design the explosion-protection system and installation.
	2.2	Where applicable explosion-protection system and installation design is verified with statutory authority for compliance with requirements.

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ELEMENT	PERFORMANCE CRITERIA	
3 Implement explosion-protection strategies.	3.1	Competent person or persons are engaged to install explosion-protected equipment and wiring system.
	3.2	Procedures are implemented to ensure the explosion-protected equipment and wiring system installation is tested and inspected in accordance with requirements.
4 Establish and implement procedures for maintaining explosion-protection.	4.1	Competent person or persons are engaged to develop inspection/maintenance schedules, including the level and intervals for periodic inspections, for the explosion-protected equipment and wiring system.
	4.2	Procedures are developed to ensure periodic inspections; testing and maintenance are carried out to documented schedule and in accordance with requirements.
	4.3	Procedures are established for assuring data related to explosion-protection is filed in the verification dossier in accordance with requirements.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and ensuring the safety of hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM078A Hazardous areas compliance requirements

Evidence shall show an understanding of hazardous areas compliance requirements to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’

the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection

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REQUIRED SKILLS AND KNOWLEDGE

installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties

Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.

- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 The responsibilities of a person managing activities or a site related to a hazardous area, encompassing:

- OHS procedures that are to be established;
- responsibilities for ensuring that a hazardous area is safe; and
- responsibilities and processes for establishing and maintaining a verification dossier.

T6 Explosion-protection strategies in relation to a hazardous area, encompassing:

- the process of classifying a hazardous area;
- various ways in which electrical systems /apparatus can be treated to prevent them from becoming an ignition source; and
- the cost of the different ways of treating electrical systems/apparatus associated with hazardous areas.

T7 Requirements for the maintenance of electrical systems associated with hazardous areas, encompassing:

- the type and grades of inspection of hazardous areas;
- maintenance programs for electrical explosion-protected systems/apparatus; and
- documentation requirements associated with maintenance procedures.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Ensure the safety of hazardous areas as described in 8) and including:

    A Applying relevant statutory requirements

    B Establishing procedures for engaging competent persons

    C Establishing and maintaining procedures for identifying potentially explosive hazards

    D Establishing procedures for implementing and maintaining explosion-protection strategies

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EVIDENCE GUIDE

E Applying relevant contingency management skills.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to ensuring the safety of hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competence development in this unit may be arranged concurrently with competencies in general plant management.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to any classified hazardous area.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5**)

Hazards

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UEENEEM079A Design of gas detection systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the selection aspects of gas detection equipment for the design of gas detection systems and installations for hazardous areas. It requires the ability to establish equipment parameters and to evaluate these against manufacturer specifications.

This unit is directly equivalent to the Unit *2.19 Design gas detection systems and installations* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to engineering design job function at, at least, an engineering associate level.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in any of the following units.

UEENEEM057A	Design explosion-protected electrical systems and installations gas atmospheres

OR

UEENEEM058A	Design explosion-protected electrical systems and installations dust atmospheres

OR

UEENEEM059A	Design explosion-protected electrical systems and installations pressurisation

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Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Establish gas detection parameters.	1.1	Requirements for gas detection are obtained or established with the appropriate personnel.
	1.2	The parameters for gas detection are obtained and documented from consultation with appropriate personnel.
	1.3	An explosion-protection requirement for gas detection equipment is established from area classification documents.
2 Select gas detection equipment.	2.1	Manufacturer specification and limitations of appropriate gas equipment are sought.
	2.2	Manufacturer specification and limitations are compared with the established parameters for gas detection.
	2.3	Gas detection equipment is selected on compatibility with the established parameters and economic considerations.

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ELEMENT	PERFORMANCE CRITERIA	
3 Document details of gas detection equipment to be used.	3.1	Proposed gas detection equipment is checked under established procedures for compliance with all relevant requirements.
	3.2	A complete specification for gas detection equipment to be used is documented in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and designing gas detection systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM079A Gas detection systems

Evidence shall show an understanding of gas detection systems to an extent indicated by the following aspects:

T1 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T2 Techniques for the installation and maintenance of fixed gas detection equipment encompassing:

- Use of manufacturer’s instruction manual; for example, operating instructions, adjustments procedures and operational limitations.
- Installation and maintenance of Standards and/or Codes of Practice for gas detection equipment.

T3 Location of fixed sample points or sensors encompassing:

- optimal sensing;
- maintainability and ease of calibration; and
- protection against environmental and mechanical damage.

T4 Gas and vapour releases encompassing—

- the nature of a site; and
- natural and mechanical ventilation.

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REQUIRED SKILLS AND KNOWLEDGE

T5 Common problems with fixed gas detectors.

T6 Calibration and response checking.

T7 Factors to consider in the evaluation and selection of portable and fixed gas detection equipment encompassing:

- Requirements for gas detection for a given situation:
  - sources for obtaining data on physical chemistry of the gas to be detected; and
  - sources for obtaining data on the conditions under which the gas may be present.
  - processes of assessing the specifications of gas detection equipment against established requirements.

T8 Detecting gases and vapours encompassing:

- apparatus capability and users' knowledge;
- propagation of gases - This includes release of gas and vapours, ventilation, density, temperature and location.
- gases to be detected and not to be detected;
- intended application;
- environmental effects;
- safety when monitoring for flammable gases where personnel could be present;
- common properties of gases and vapours - This includes density of gases, vapours and their mixtures; effect of temperature on density; LEL and UEL of combustibles and toxicity.
- the differences between detecting gases and vapours - These include added complication of evaporation, condensation and temperature effects of vapours and their effect on propagation, calibration and detection, including sampling.

T9 Oxygen deficiency and effects on safety encompassing:

- chemical reaction of oxygen with solid products;
- chemical reaction of oxygen with gaseous products; and
- dilution of the air by displacement by some other gas or vapour.

T10 Measuring principles of catalytic sensors, electrochemical sensors, infrared sensors and semi-conductor sensors encompassing:

- common applications;
- limitations and safety;
- interferences of other gases with the measurement; and
- poisoning of the sensor.

NOTE: Detailed information on gas detection is given in AS/NZS 60079.29.2.

T11 Measuring principles of thermal conductivity sensors, flame ionization, detectors (FID), flame temperature analyzers (FTA), photo ionisation detectors (PID) and paramagnetic oxygen detectors.

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REQUIRED SKILLS AND KNOWLEDGE

T12 Selection of apparatus encompassing:

- environment;
- system response delay; and
- gas to be detected with respect to measurement principles.

T13 Behaviour of gas and vapour releases encompassing:

- rate of release;
- density; and
- temperature/pressure.

T14 Design and installation encompassing:

- sensor, sampling or open path;
- location;
- site; and
- environmental conditions.

NOTE: These include adverse weather, excess temperature, vibration and other mechanical interference, hosing, airborne contaminants and corrosion.

T15 Integrity and safety encompassing:

- redundancy; and
- protection against loss of power supply.

T16 Commissioning and scheduled maintenance encompassing:

- sample lines;
- diffusion sensor screens;
- initial gas calibration;
- adjustment of alarm set points; and
- plans and records.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of 9.1)

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EVIDENCE GUIDE

Assessment

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated

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EVIDENCE GUIDE

within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Design gas detection systems as described in 8) and including:

    A Accessing and interpreting gas detection needs and parameters.

    B Providing selection options based on parameters for gas detection and economic considerations.

    C Following checking and documentation procedures.

    D Applying relevant contingency management skills.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to designing gas detection systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort competency development in this unit may be arranged concurrently with any of the following units.

UEENEEM056A Design explosion-protected electrical systems and installations gas atmospheres

UEENEEM057A Design explosion-protected electrical systems and installations gas atmospheres

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EVIDENCE GUIDE

UEENEEM058A Design explosion-protected electrical systems and installations dust atmospheres

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to the design of electrical systems for any classified explosive gas atmosphere hazardous area.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEM080A Report on the integrity of explosion-protected equipment in a hazardous area

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG105A Verify compliance and functionality of general electrical installations	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of process control installations	
4	Update		Update recommended pre-requisite MEM07001B Perform operational maintenance of machines/equipment	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers the explosion-protection aspects of plant and machinery operation and maintenance. It requires the ability to visually identify any damage or deterioration of explosion-protected equipment, monitor changes in the explosion hazard and to implement procedures established to limit the risk of an explosion.

This unit is directly equivalent to the Unit 2.2 *Report on the integrity of explosion-protected equipment in hazardous areas* in the Australian/New Zealand Standard *AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas* (*EEHA*) *Part 1*: *Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

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Application of the Unit

Application of the Unit **4**)

This unit augments other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to management, plant operation, maintenance and engineering job functions at AQF 2 or higher.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions at least at AQF 2 or equivalent. Examples are, (but not limited to).

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Prerequisite Unit(s) **2)**

UEENEEG105A	Verify compliance and functionality of general electrical installations
UEENEEI112A	Verify compliance and functionality of process control installations
MEM07001B	Perform operational maintenance of machines/equipment
PMAOPS201B	Operate fluid flow equipment

Employability Skills Information

Employability Skills **3**)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to work in hazardous area.	1.1	Nature of the explosion hazard in the area is known and the status of the explosion hazard is ascertained through established procedures.
	1.2	Operation and condition of plant and machinery, with regards to explosion-protection, is

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ELEMENT	PERFORMANCE CRITERIA	
		ascertained through established procedures.
	1.3	Established procedures for use of the plant and machinery, with regards to explosion-protection techniques used in the area, are followed.
2 Observe condition of explosion-protection system area.	2.1	OHS policies and procedures, with regards to explosion-protection, are followed.
	2.2	Performance of plant and machinery is monitored to identify faults that may affect the integrity of the explosion-protected equipment and wiring system.
	2.3	Observations of explosion-protected equipment and wiring are made during normal operations and visual non-conformances that may affect the integrity of the explosion-protection technique are identified.
	2.4	Explosion hazard monitoring equipment is observed and a potentially dangerous state of the hazard is identified, e.g. by using gas detectors.
3 Take actions to limit risk of an explosion.	3.1	Variations outside normal operating conditions are reported and documented in accordance with established procedures
	3.2	Non-conforming tools, equipment and testing devices are reported and documented in accordance with established procedures.
	3.3	Established procedures are followed in the event of a potential or immediate hazardous condition arising from any non-conformance identified in equipment/wiring or changes in the explosion hazard to a potentially dangerous state.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and reporting on the integrity of explosion protected equipment in hazardous areas.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EM080A Hazardous areas and explosion-protection principles

Evidence shall show an understanding of hazardous areas and explosion-protection principles (including working safely in hazardous areas), principles of the following explosion-protection techniques and visible conditions of explosion-protection equipment that indicate the protection is void and changes in the nature of the explosion hazard that may render the explosion-protection unsafe. to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises

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REQUIRED SKILLS AND KNOWLEDGE

and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties

Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.

- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection visual checks encompassing:

- occupational, health and safety procedures to be followed before entering hazardous areas; and while conducting visual inspection.
- Visible defects in explosion-protected equipment and wiring.
- Conditions that may indicate a change in a given explosion hazard.

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REQUIRED SKILLS AND KNOWLEDGE

- Reporting defects in explosion-protected equipment and wiring - the purpose of a verification dossier; and various ways for reporting defects in explosion-protected equipment and wiring.
- procedures to be followed in the event of a change in the explosion hazard.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence

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EVIDENCE GUIDE

decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Report on the integrity of explosion-protected equipment in hazardous areas as described in 8) and including:

    A Following work permits and clearance procedures.

    B Monitoring hazards and following evacuation procedures.

    C Correctly operation of plant and machinery.

    D Following plant and electrical isolation procedures.

    E Identifying visual damage or deterioration of explosion-protected equipment.

    F Reporting visual defects.

    G Applying relevant contingency management skills.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to reporting on the integrity of explosion protected equipment in hazardous areas.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given industry or enterprise for plant or machinery operation or in relation to installation, maintenance or service functions.

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any classified hazardous area.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

2.2) Literacy and numeracy skills

Competency Field **5**)

Hazards

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UEENEEN101A Maintain mechanical rail signalling equipment and infrastructure

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers maintenance of mechanical signalling and infrastructure, connected to electro mechanical equipment. It encompasses safe working, regulatory requirements, following maintenance procedures, checking operation and functionality of signalling equipment and infrastructure, and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under the codes of practice and regulations of the State/Territory for which the work is carried out. This includes codes of practice such as the ‘Code of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare maintain mechanical signalling equipment and infrastructure	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Maintenance is appropriately sequenced in accordance with job schedule
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	Location of equipment to be maintained is determined from job specifications and diagrams
	1.7	Materials needed for maintenance are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to conduct maintenance work are obtained in accordance with established procedures and checked for correct operation and safety

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ELEMENT	PERFORMANCE CRITERIA	
2 Carry out the maintenance of mechanical signalling equipment and infrastructure	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	All chemicals, lubricants and consumables are used and disposed of in compliance with material safety sheets and OHS codes and practices.
	2.3	All rubbish, weeds and obstructions are removed from equipment and housings.
	2.4	Initial visual check of operational equipment is performed to identify any equipment faults.
	2.5	External surfaces are prepared/painted to organisation standards to protect the equipment.
	2.6	All internal surfaces and operational components are cleaned and lubricated to ensure operational effectiveness.
	2.7	Maintenance is carried out in accordance with relevant standards and requirements and established routines.
	2.8	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.
	2.9	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.10	Maintenance is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete the maintenance of mechanical signalling equipment and infrastructure	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Approval to conduct a check of equipment

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ELEMENT	PERFORMANCE CRITERIA	
		operation is obtained in accordance with relevant operational rules and procedures.
	3.3	Track clearance check is made before conducting equipment operation check to ensure safe train movement.
	3.4	Authorised equipment check is carried out in accordance with operating procedures to identify any equipment faults.
	3.5	Operational effectiveness of equipment is confirmed through observation during train movements if required.
	3.6	Equipments faults are correctly identified; recorded and appropriate corrective action is taken.
	3.7	Equipment is locked and secured to prevent unauthorised access.
	3.8	Work completion is documented and appropriate person(s) notified in accordance with established procedures, and relevant reports produced.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and servicing mechanical rail signalling equipment and infrastructure.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN101A Mechanical rail signalling equipment and infrastructure maintenance requirements and techniques

Evidence shall show an understanding of mechanical rail signaling equipment and infrastructure maintenance requirements and techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Basic rail operations encompassing:

Rail terminology

Train dynamics

Essentials of safe movement of trains

Purpose of rail signaling

Rail signaling, regulations and codes encompassing:

Codes philosophy and format

How to read and apply a code

Codes that apply to rail signaling - relevant to a particular rail network.

Technical manuals and catalogues encompassing:

Typical format

How to read and apply information

Environmental and heritage awareness encompassing:

Purpose of environmental and heritage regulation

Typical issues affecting electrotechnology services and systems

Meeting requirements

Enterprise work activities records encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

Purpose and extent of maintaining work activities records in an enterprise

Types of records for maintaining work activities in an enterprise

Methods for recording and maintaining work records

Work records required by regulation requirements

Electrical safe working practices encompassing:

Risk management and assessment of risk:

Principle and purpose of risk management, and

Processes for conducting a risk assessment

Hazards associated with low-voltage, extra-low voltage and high-currents;

Arrangement of power distribution and circuits in an electrical installations

Parts of an electrical system and equipment that operate at low-voltage and extra-low voltage,

Parts of an electrical system and equipment where high-currents are likely.

Safety, selection, use, maintenance and care of test equipment:

Safety characteristics of electrical testing devices,

Safe use of electrical testing device, and

Checks and storage methods for maintaining the safety of testing devices.

Rail safe working practices encompassing:

Rail enterprise safety standard and procedures

Rail safe working requirements

Possessions protection and management

Rail signaling, drawings and diagrams encompassing:

Drawing types and applications encompassing:

Drawing layouts and conventions.

Drawing symbols

Cable and equipment schedules

Rail signaling principles, mechanical encompassing:

Overview of mechanical rail signaling

Purpose of elements of a mechanical rail signaling systems - signals, point actuating

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REQUIRED SKILLS AND KNOWLEDGE

systems, locking and train detection systems, control input devices, indicators, diagrams and monitors, interlocking, and safe working systems.

Rail signaling, mechanical equipment encompassing:

Equipment and their components

Operating principles

Servicing procedures.

Rail signaling, point actuating devices encompassing:

Equipment and their components - point machines, detectors, claw/clamp locks, swing nose mechanisms, in-bearer mechanisms

Operating principles

Servicing procedures

Rail signaling, interlocking systems, mechanical encompassing:

Equipment and their components

Operating principles and parameters

Servicing procedures

Rail signaling, electro-pneumatic equipment encompassing:

Equipment and their components - compressors, air lines, control valves

Operating principles and parameters

Servicing procedures.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Service mechanical signalling equipment and infrastructure as described in 8) and including:

  a. Interpreting specifications correctly

  b. Maintaining equipment in accordance with workplace procedures

  c. Using chemicals and tools safely

  d. Testing that equipment is fully functional after maintenance

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e. Checking that technical/operational specifications are met and that equipment is in compliance with work orders
f. Applying effective fault diagnosis techniques,
g. Ensuring safe trained movement through work area,
h. Following relevant codes of practice, OHS and environmental protection procedures and requirements
i. Completing relevant technical reports, records and documentation, and
j. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to servicing mechanical signalling equipment and infrastructure.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Code of practice for the defined interstate rail network.

Equipment relevant to a particular rail network may include the following:

- Mechanical signalling equipment may include points, derails, signals, rodding & cranks, signal leads, annett locks, and ground frames.
- Infrastructure may include foundations, signal structures, housings and platforms.
- Electromechanical equipment may include lever locks, releasing switches, point detectors/controllers, circuit controllers, indication & repeating devices.
- Test equipment may include mechanical measurement devices, to specified tolerance. (e.g. steel rule, gauges), multimeter

Activities may include: maintenance, cleaning, and lubricating of equipment using work procedures, location: & circuit plans and locking sketches.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN102A Assemble and wire internal electrical rail signalling equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers assembly and wiring internal signalling equipment for location boxes, enclosures and equipment rooms. It encompasses safe working, regulatory requirements and following work procedures assembling and mounting components, performing internal wiring, terminating cables, and wiring and testing to certify equipment.

Application of the Unit

Application of the Unit

2)

This unit shall apply to qualifications in installations and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice, such as ‘Code Of Practice for the defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEG 063A	Arrange circuits, control and protection for general electrical installations

AND

work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to assemble and wire internal signalling equipment	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Technical requirements relating to specific signalling equipment are established.
	1.5	Assembly and wiring is appropriately sequenced in accordance with job schedule
	1.6	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.7	Materials needed for assembly and wiring are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to assemble and wire equipment are obtained in accordance with established procedures and checked for correct operation and safety

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ELEMENT	PERFORMANCE CRITERIA	
2 Assemble and wire internal signalling equipment	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Equipment is assembled, wired, connected and labelled to comply with technical standards and job specifications and requirements.
	2.3	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.
	2.4	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.5	Equipment is assembled, wired, connected and labelled efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete the assembly and wiring of internal signalling equipment	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	All terminations are tested in accordance with appropriate testing procedures to ensure tightness and functionality.
	3.3	Mandatory continuity and insulation tests are carried out at the workplace as per appropriate test procedures to ensure and verify system standards are met.
	3.4	Documentations including wiring diagrams are completed to establish procedures and requirements to ensure quality and safety issues are addressed, and relevant reports produced.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and assembling and wiring internal electrical rail signalling equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN102A Install electrical rail signalling equipment

Evidence shall show an understanding of internal electrical rail signalling equipment assembly and wiring, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Rail signalling principles, mechanical encompassing:

- Overview of mechanical rail signalling
- Purpose of elements of a mechanical rail signalling systems - signals, point actuating systems, locking and train detection systems, control input devices, indicators, diagrams and monitors, interlocking, and safe working systems.

T2. Rail signalling, regulations and codes encompassing:

- Codes philosophy and format
- How to read and apply a code
- Codes that apply to rail signalling

  Note: Codes are relevant to a particular rail network.

T3. Technical manuals and catalogues encompassing:

- Typical format
- How to read and apply information

T4. Electrical safe working practices encompassing:

- Risk management and assessment of risk:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents:
  - Arrangement of power distribution and circuits in an electrical installations
  - Parts of an electrical system and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electrical system and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage:
  - Parts of an electrical system and equipment that operate at high-voltage,
  - The terms ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage, and

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REQUIRED SKILLS AND KNOWLEDGE

- Control measures used for dealing with the hazards of high-voltage.
- Optical fibre safety:
  - Coherent optical sources and joining procedures
  - Laser safety class 3a devices or their replace
- Risks and control measures associated with low voltage:
  - Risks associated with modifying electrical installations, fault finding, maintenance and repair.
  - Control measures before, while and after working on electrical installations, circuits or equipment.
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Risks and control measures associated with harmful dusts and airborne contaminants - thermal insulation, fibrous cement materials and asbestos and other fibre reinforced switchboard materials.
- Safety, selection, use, maintenance and care of test equipment:
  - Safety characteristics of electrical testing devices,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

T5. Rail safe working practices encompassing:

- Rail enterprise safety standard and procedures
- Rail safe working requirements
- Possessions protection and management

T6. Rail signalling, drawings and diagrams encompassing:

- Drawing types and applications encompassing:
  - Drawing layouts and conventions.
  - Drawing symbols
- Cable and equipment schedules

T7. Rail signalling, mechanical equipment encompassing:

- Equipment and their components
- Operating principles
- Servicing procedures.

T8. Rail signalling, electro-pneumatic equipment encompassing:

- Equipment and their components

  Note: Examples include compressors, air lines, control valves
- Operating principles and parameters
- Servicing procedures.

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REQUIRED SKILLS AND KNOWLEDGE

T9. Inverters encompassing:

- Features and characteristic of inverters under load and no-load characteristics - circuit configuration, input and output wave forms, relationship between input and output voltages and output voltage under load conditions.
- Faults in inverters
- Typical applications of inverters

T10. Linear and switch mode power supplies encompassing:

- Operation and characteristics of switched mode power supplies
- Isolation requirements and circuitry
- Operation of step-down and step-up regulators
- DC to DC converters
- Operation of variable frequency and pulse width modulated regulation techniques
- Radiation suppression circuitry
- Diagnostic procedures to isolate faults

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and

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regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the time frames typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement

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- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Assemble and wire internal electrical signalling equipment as described in 8) and including:

  a. Interpreting specifications correctly
  b. Assembling and wiring equipment to specified/technical workplace requirements
  c. Following correct testing procedures
  d. Ensuring assembled/wired equipment operates to specifications
  e. Using appropriate tools correctly and safely
  f. Following relevant codes of practice, OHS and environmental protection procedures and requirements
  g. Conducting mandatory tests and identifying non-conformance using effective workplace methods
  h. Interpreting signalling circuit diagrams
  i. Completing mandatory reporting.
  j. Completing relevant technical reports, records and documentation, and
  k. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assembling and wiring internal electrical signalling equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Code of practice for the defined interstate rail network.

Note: Internal equipment is that associated with location boxes, enclosures and equipment rooms

Equipment relevant to a particular rail network may include, and not be limited to

- relay, racks/frames/enclosures, switch circuit controllers, telephones, and vital computer based interlocking modules

Components may include: relays, fuses, terminals, transformers, lightning arresters, resistors, leads, switches and conduits, relay plug boards and electronic components

Plant may include: Vehicle mounted crane, Generators and Scissor lift

Test equipment may include: continuity tester, insulation tester, multimeter, earth leakage tester

Specialised tools may include: crimpers, relay spring clip removal tool, plug coupler pin removal tool and explosive power tools.

Activities may include: assemble procedures, mounting, and wiring of internal equipment using plans, completion of testing documentation.

Testing may include: inspection, continuity, wire count, null count, etc in a simulated environment or operational test on specific signalling equipment to specified tolerance.

Technical report may include: incident report, equipment report, and site survey report.

Certify may include ensuring the equipment is assembled and wired in accordance with the design.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN103A Install and maintain rail track circuit leads and bonds

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and maintenance of track circuit leads and bonds. It encompasses safe working, regulatory requirements and following work procedures, job planning, running and positioning, connecting track leads and bonds, maintaining and testing track leads and bonds and completing required documentation.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN102A	Assemble and wire internal electrical rail signalling equipment

AND

work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and maintain track circuit leads and bonds	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Installation and maintenance of track circuit leads and bonds is appropriately sequenced in accordance with job schedule.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Installation and maintenance instructions are reviewed to obtain clear and concise work requirements.
	1.7	Site bonding layout plan is reviewed to clarify bonding requirements.
	1.8	Material needed to install and maintain track circuit leads and bonds is obtained in accordance with established procedures and checked against job requirements
	1.9	Tools, equipment and testing devices needed to install and maintain track circuit leads and bonds are obtained in accordance with established procedures and checked for correct operation

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ELEMENT	PERFORMANCE CRITERIA	
		and safety
	1.10	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements
2 Install and maintain track circuit leads and bonds	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Specified leads of bonds are run and positioned appropriately to the formation conditions and to minimise potential damage from track maintenance machines.
	2.3	Positions of boxes and cable pits are checked to ensure compliance with specifications and appropriate follow up action is initiated where necessary.
	2.4	Components and rail surfaces are prepared to ensure secure and sound connections can be made.
	2.5	Leads or bonds are connected using appropriate fastening techniques and ensuring technical compliance is achieved.
	2.6	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.
	2.7	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.8	Track circuit leads and bonds are installed and connected efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.9	Bonds, leads and rail connections are inspected for damage or deterioration and appropriate corrective action is initiated.
	2.10	Appropriate tests are completed to identify components requiring repair or replacement.

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ELEMENT	PERFORMANCE CRITERIA	
	2.11	Repair or replacement of components is carried out with due regard to train movements and safety of personnel involved.
	2.12	Temporary bonding is installed where required and electrical readings on bonds/lead connections and insulated rail joints are taken to ensure compliance with specifications and site bonding layout plan.
	2.13	Track related equipment is inspected for faults or damage and all faults are documented and appropriate follow up action is initiated.
3 Complete installation and maintenance of track circuit leads and bonds	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Work completion is documented and appropriate person(s) notified in accordance with established procedures, and relevant reports produced

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining track circuit leads and bonds.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN103A Rail track circuit leads and bonds installation and maintenance

Evidence shall show an understanding of tail track circuit leads and bonds installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Basic rail operations

Rail terminology encompassing:

Rail signalling nomenclature

Rail signalling symbols

State/Territory Standards (where they apply)

Standard glossary of terms relevant to each State/Territory.

Note:

Identify where the standard originated from and how new standards are developed to meet a national standard.

Train dynamics encompassing:

Types of rail vehicles

Note:

Vehicles include: Suburban/country passenger, freight, maintenance vehicles and heritage/tourism.

Braking distance

Gradients/terrain

Sighting distance

The relationship to the Signalling arrangement plan/scheme.

Essentials of safe movement of trains encompassing:

The role of the signalling system in enabling safe and efficient movement of trains

Standard operating conditions as per operating timetable/schedule

Degraded signalling system performance

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REQUIRED SKILLS AND KNOWLEDGE

Note: Degraded may be partial failure of signalling infrastructure or a system override

Abnormal train operating conditions

Note:

Examples are signaller operation error, driver operation error, train delayed and train breakdown.

Emergency train and signal system operation

Scheduled infrastructure maintenance

Unscheduled infrastructure maintenance.

Note:

Examples are civil, signalling, traction and overhead.

Purpose of rail signalling encompassing:

Safe distances between rail vehicles

Safe movement of rail vehicles

Conflicting movement between rail vehicles

How the signalling system provides driver information

How the driver interprets the information to safely control a train

How the signalling system restricts the signaller and driver following an operation error.

Note:

Examples of error are: signals passed at stop, driver exceeding speed requirement and signaller setting incorrect route.

Enterprise work activities records

Purpose and extent of maintaining work activities records in an enterprise

Types of records for maintaining work activities in an enterprise

Methods for recording and maintaining work records

Work records required by regulation requirements

Environmental and heritage awareness

Purpose of environmental and heritage regulation

Typical issues affecting electrotechnology services and systems

Meeting requirements

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain rail track circuit leads and bonds as described in 8) and including:

  a. Interpreting specifications correctly

  b. Installing and maintaining track circuit track leads and bonds correctly

  c. Applying bonding techniques correctly

  d. Ensuring bonds and leads testing and test results comply

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with technical requirements

e. Complying with any local fire bans/restrictions
f. Selecting and use tools correctly
g. Following relevant codes of practice, OHS and environmental procedures and requirements
h. Interpreting relevant diagrams and track insulation plans
i. Completing relevant technical reports, records and documentation
j. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and maintaining track circuit leads and bonds.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation and maintenance functions.

Concurrent assessment may include:

UEENEEN105A Install and maintain rail signalling power supplies

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Code of practice for the defined interstate rail network.

Activities may include the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Material may include : galvanised steel, copper, aluminium,

Types of bond may include: signalling bonding, traction bonding (permanent and temporary), continuity bonding, equipotential bonding, and structure bonding.

Connection methods may include: channel pin, plug bonds, cadweld, tapered bolt, pin brazing.

Test Equipment may include; continuity tester, tong meter, insulation tester and multimeter.

Technical report may include: incident report, equipment report, and site survey.

Plant may include; grinders, cadweld equipment, rail drilling machine, hydraulic tools, and generators.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN104A Test copper rail signalling cables

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers testing of signal and communication copper cables. It encompasses safe working, regulatory requirements and following work procedures determining the tools required setting up and conducting test, interpreting test results, determining activities to maintain system integrity and reporting activities.

Application of the Unit

Application of the Unit **2)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried

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License to practice **3)**

out on that network.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 121A	Repair rail signalling power and control cables

AND

Relevant work place requirements in ‘Work site protection’ have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to test rail signalling cable	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Access times and methods are confirmed to comply with customer requirements and relevant legislation
	1.5	Service is checked for availability for testing and is isolated/disconnected from use and carriers network/equipment to ensure no equipment damage can occur during testing
	1.6	Required tests and purpose of tests are identified from site, client documentation and manufacturer specifications
	1.7	Tools and testing devices needed for cable testing are obtained in accordance with established procedures and checked for correct operation and safety
	1.8	Testing devices calibration certification is checked and is current to ensure manufacturers specifications are achieved

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ELEMENT	PERFORMANCE CRITERIA	
2 Test rail signal cables	2.1	Work area and cable system is made safe for testing and other OHS risk control measures and procedures for carrying out the testing are followed.
	2.2	Tests are set up and performed in accordance with safety measures and manufacturer specifications.
	2.3	Test results are read accurately and compared against manufacturers and site specifications for cable performance
	2.4	Established methods for dealing with unexpected situations are dealt with safely and with the approval of an authorised person
	2.5	Testing is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.6	Available services are connected and tested for functionality to ensure all previous services have been resumed
3 Report test results	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Recommendations on actions needed to maintain cable system integrity resulting from cable tests are made and documented
	3.3	Results of tests are documented accurately and without delay to ensure test results remain current
	3.4	Site and installation files are updated to ensure traceability of information on system performance is maintained, and relevant reports produced

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and performing copper rail signalling cable tests.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN104A Rail signalling cable testing

Evidence shall show an understanding of rail signalling cable testing, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Performance parameters associated with copper cables and coaxial cables encompassing:

Open circuit, short circuit and pair continuity

Split pair and crossed pair

Attenuation

Return loss

Insulation Resistance (leakage)

Near end cross talk (NEXT)

Attenuation to cross talk ratio (ACR)

Loop resistance

Noise (Impulse noise and average noise)

Characteristic impedance

Note: Structured cabling including, twisted pair cabling, shielded twisted pair (STP), unshielded twisted pair (UTP) and higher performance cabling.

Test results for compliance with required regulation, standards, and or codes for structured copper cables and coaxial encompassing:

Tests required to evaluate a given performance parameter

Test equipment and leads needed to evaluate a given performance parameter.

Operation of test equipment for correct evaluation of specific cable performance parameters and to obtain accurate and reliable results.

Transmission performance requirements.

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REQUIRED SKILLS AND KNOWLEDGE

Typical causes of non compliant test results.

Enterprise work activities records encompassing:

Purpose and extent of maintaining work activities records in an enterprise

Types of records for maintaining work activities in an enterprise

Methods for recording and maintaining work records

Work records required by regulation requirements

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the time frames typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Perform copper rail signalling cable tests as described in 8) and including:

  a. Interpreting plans and specifications correctly,
  b. Testing cable in accordance with workplace procedures,
  c. Using test equipment and tools correctly and safely,
  d. Confirming the integrity of a cable system,
  e. Checking that technically/operational specifications are met and that cable is in compliance with specification,
  f. Following relevant codes of practice, procedures and requirements, and
  g. Completing relevant technical reports, records and documentation
  h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to performing cable system tests.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise testing functions relating to cables, repairing cables and testing cables.

Concurrent assessment may include:

UEENEEN121A Repair rail signalling cables

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Code of practice for the defined interstate rail network.
- Testing and identifying at least five non-compliant test results.

Activities may include procedures for the isolation of cable from supply and/or equipment, and may also include the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Activities may also include; determining fit for purpose, compliance and functional testing and completing the necessary documentation.

Test equipment could include; insulation resistance and continuity tester, multimeter, bell/buzz tester, voltage detector and or daisy chain.

Specialised equipment, tools and devices could include cable locator and cable fault tester.

Equipment relevant to a particular rail network.

Associated hardware could include Trunking, cable pits, conduits and terminals.

Cable types may include; copper (all categories) and co-axial

Tests may typically address the following items: attenuation, length, balance, noise levels, pair assignment, reversals, short circuits, open circuits, insulation resistance, reflection, signal loss, expected response times, speed, loop resistance

Technical report may include: incident report, cable test report, and site survey.

Other test devices may also include: TDR (Time Domain Reflectometer), multimeter, tong meter, proprietary devices, oscillator and probe set, bridge megger (computerised), pulse echo, hand held cable testers, spectrum analysers, ohmmeters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN105A Install and maintain rail signalling power supplies

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation and maintenance of rail signalling power supplies. It encompasses working safely and to installation/maintenance standards, matching equipment with that specified for a given location, terminating cables and connecting wiring, compliance and functional testing, certifying and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 102A	Assemble and wire internal electrical rail signalling equipment

AND

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install and maintain signalling power supplies	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	Safety hazards which have not previously been identified are noted, and established risk control measures are implemented.
		1.4	Nature of the work and location of power supply is determined by site inspection and from job instructions, specifications and/or diagrams.
		1.5	Materials needed for the installation, maintenance/repair work are obtained in accordance with established procedures and checked against job requirements.
		1.6	Tools, equipment and testing devices needed to install or maintain/repair power supplies are obtained in accordance with established procedures and checked for correct operation and safety.
2	Install and maintain signalling power supplies	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Power supply is installed to comply with technical standards and job specifications and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Wiring is run and cables terminated to comply with technical standards and job specifications and requirements.
	2.4	Tests are conducted to ensure installed, maintained/ repaired power supply complies with specifications and functions as intended.
	2.5	Installation, maintenance/repair of power supply is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.6	Correct functioning of equipment is established from reference to manuals, system specifications and commissioning data.
	2.7	Faults are identified by reference to appropriate technical information and applying knowledge of power supplies to logical fault finding techniques.
	2.8	Faulty, worn, damaged or insecure components are replaced, repaired or secured in accordance with manufacturer specifications and enterprise requirements.
	2.9	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.
3 Complete installation and maintain of signalling power supplies	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Work completion is documented and appropriate person(s) notified in accordance with established procedures, and relevant reports produced.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining rail signalling power supplies.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN105A Rail signal power supply installation and maintenance

Evidence shall show an understanding of rail signal power supply installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Basic rail operations

Rail terminology encompassing:

Rail signalling nomenclature

Rail signalling symbols

State/Territory Standards (where they apply)

Standard glossary of terms relevant to each State/Territory.

Note:

Identify where the standard originated from and how new standards are developed to meet a national standard.

Train dynamics encompassing:

Types of rail vehicles

Note:

Vehicles include: Suburban/country passenger, freight, maintenance vehicles and heritage/tourism.

Braking distance

Gradients/terrain

Sighting distance

The relationship to the Signalling arrangement plan/scheme.

Essentials of safe movement of trains encompassing:

The role of the signalling system in enabling safe and efficient movement of trains

Standard operating conditions as per operating timetable/schedule

Degraded signalling system performance

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REQUIRED SKILLS AND KNOWLEDGE

Note: Degraded may be partial failure of signalling infrastructure or a system override

Abnormal train operating conditions

Note:

Examples are signaller operation error, driver operation error, train delayed and train breakdown.

Emergency train and signal system operation

Scheduled infrastructure maintenance

Unscheduled infrastructure maintenance.

Note:

Examples are civil, signalling, traction and overhead.

Purpose of rail signalling encompassing:

Safe distances between rail vehicles

Safe movement of rail vehicles

Conflicting movement between rail vehicles

How the signalling system provides driver information

How the driver interprets the information to safely control a train

Restrictions on the signaller and driver following an operation error.

Note:

Examples of error are: signals passed at stop, driver exceeding speed requirement and signaller setting incorrect route.

Enterprise work activities records

Purpose and extent of maintaining work activities records in an enterprise

Types of records for maintaining work activities in an enterprise

Methods for recording and maintaining work records

Work records required by regulation requirements

Environmental and heritage awareness

Purpose of environmental and heritage regulation

Typical issues affecting electrotechnology services and systems

Meeting requirements

Rail signalling, power supplies

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REQUIRED SKILLS AND KNOWLEDGE

Equipment and their components encompassing:

Transformers

Batteries

Converters

Inverters

UPS

Generator

Solar Panels

Earthing

Surge protection

Switchboards

High voltage and low voltage power distribution

Automatic power changeover panels

Wiring and termination.

Operating principles and parameters encompassing:

Normal mode operation

Alarm mode

Redundancy mode

Power interruption / standby mode

Interpreting circuits diagrams to evaluate correct operation and relationship to other signalling circuits.

Servicing procedures encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled / preventative maintenance

Unscheduled / corrective maintenance

Certifying power supply equipment (commission and de-commission).

- Note:

Certifying procedures are only applicable for compliance with rail operator and/or enterprise standards.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing

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assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain rail signalling power supplies as described in 8) and including:

    a. Interpreting specifications and circuit diagrams correctly

    b. Maintaining, repairing and installing power supplies correctly

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c. Using appropriate diagnostic and fault finding techniques
d. Using tools and test instruments correctly
e. Following relevant codes of practice, procedures and requirements
f. Completing relevant technical reports, records and documentation, and
g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and maintaining signalling power supplies.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN102A Assemble and wire internal electrical rail signalling equipment

UEENEEN118A Find and repair rail signal system faults

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Code of practice for the defined interstate rail network.

Activities may include procedures for the isolation of power supplies and may also include the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Activities may also include: determining fit for purpose, installation of power supplies, maintenance of power supplies, terminating cables and connecting wiring, compliance and functional testing and completing the necessary documentation.

Codes/practices could include dial before you dig.

Plant may include: portable generators

Equipment relevant to a particular rail network may include, but not be limited to, the following:

Electrical equipment may include; Power supplies, including; low voltage AC, low voltage DC, electro-hydraulic, electro, pneumatic, solar, generators, alternators, batteries and surge protection

Test equipment may include; multimeters, insulation resistance and continuity testers, battery testers, pneumatic pressure gauges and hydraulic pressure gauges

Technical report may include: incident report, electrical access report, site survey and data log report.

Power supplies may include: standby plants, battery chargers, solar supplies, regulated power supplies, uninterrupted power supplies, primary and secondary supplies

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN106A Install and maintain non-vital screen based control systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the installation, maintenance and repair of non-vital indication screen based control systems on rail networks. It encompasses safe working, regulatory requirements and following work procedures, performing scheduled maintenance, finding and repairing faults, testing control and indicating equipment, certifying and reporting.

Application of the Unit

Application of the Unit

2)

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

And

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install and maintain non-vital screen based control systems	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of maintenance is determined from maintenance schedules, job specifications, drawings and regulatory requirements
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
		1.5	Materials needed for maintenance and repair work are obtained in accordance with established procedures and checked against job requirements
		1.6	Tools, equipment and testing devices needed to maintenance and repair work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Install and maintain non-vital screen based control systems	2.1	OHS risk control measures and procedures for the installation and maintenance of non-vital screen based control systems are followed.
		2.2	Non-vital screen based control systems are installed and maintained to comply with technical standards and job specifications and requirements.

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Installation and maintenance, fault finding and repairs are performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.4	System faults are verified using appropriate technical information, fault finding and diagnostic techniques to identify faulty control equipment.
	2.5	Faulty modules are replaced, adjusted and secured in accordance with manufacturer specifications and organisation procedures.
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Complete the installation and maintenance of non-vital screen based control systems	3.1	OHS risk control measures and procedures for carrying out the work are followed.
	3.2	Control equipment is adjusted and tested using appropriate test procedures and equipment to ensure it operates within the specified technical parameters.
	3.3	System faults identified beyond the scope of first level maintenance are reported for follow-up action.
	3.4	Test results are documented in accordance with organisation requirements and faulty or replaced module(s) are tagged and dispatched to maintain equipment spares, and relevant reports produced

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining non-vital screen based rail control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN106A Non-vital screen based rail control system installation and maintenance

Evidence shall show an understanding of non-vital screen based rail control system installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Rail signalling, Non-vital computer applications

Equipment and their components encompassing:

Visual display

Non vital software.

Operating principles and parameters encompassing:

Normal mode operation via indications

Failure mode via fault reports and indications.

Servicing procedures encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled/preventative maintenance

Unscheduled/corrective maintenance.

Rail Signalling, Computer peripheral application

Equipment and their components encompassing:

Visual Display Units

Keyboards

Front end processors

Printers.

Operating principles and parameters encompassing:

Normal mode operation via indications

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REQUIRED SKILLS AND KNOWLEDGE

Failure mode via fault reports and indications.

Servicing procedures encompassing:

Maintenance documentation

Operational test procedures

Scheduled/preventative maintenance

Unscheduled/corrective maintenance

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

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The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling

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employment

- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain non-vital screen based rail control systems as described in 8) and including:

  a. Reading and interpreting specifications correctly,

  b. Installation and maintenance of non-vital screen based control systems are undertaken to meet operational and technical standards

  c. Using effective fault diagnosis and repair/replacement techniques to specified level,

  d. Confirming equipment operated within specified technical parameters,

  e. Using testing equipment, instruments and tools correctly

  f. Following relevant codes of practice, environmental protection procedures and requirements, and

  g. Completing relevant technical reports, records and documentation, and

  h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining remote control and non-vital interlocking control systems and repairing faults.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN114A Install and maintain computer based interlocking rail systems

UEENEEN118A Find and repair rail signal system faults

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Code of practice for the defined interstate rail network.

Maintenance activities may also incorporate following work procedures, performing scheduled maintenance, finding and repairing faults, testing control and indicating equipment and reporting, using plans and drawings, manufacturer's / enterprise specifications and manuals.

Equipment relevant to a particular rail network may include, but not be limited to, the following:

Electrical equipment may include; computers and associated peripherals, network switches, modems, visual display units, control systems, including electronic cards, operating systems, software and firmware, cabling and associated connectors, including fibre optical, coaxial, shielded/screened and CAT 5.

Technical report may include: incident report and data log report.

Test equipment may include; laptop computer, diagnostic software and peripherals and multimeter.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN107A Install and maintain active level crossing equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and maintenance of active level crossing equipment on rail networks. It encompasses safe working, regulatory requirements and following work procedures, performing schedules maintenance findings and repairing faults, performing operational tests and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 109A	Install and maintain train detection equipment

AND

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install and maintain active level crossing equipment	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of installation and/or maintenance is determined from maintenance schedules, job specifications, drawings and regulatory requirements
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others to minimise traffic disruption
		1.5	Materials needed for the installation and/or maintenance work are obtained in accordance with established procedures and checked against job requirements
		1.6	Tools, equipment and testing devices needed for the installation and/or maintenance work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Install and maintain active level crossing equipment	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The correct functioning of equipment is established from relevant technical manuals and operating instructions to identify accessible

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ELEMENT	PERFORMANCE CRITERIA	
		operating requirements.
	2.3	Equipment and components are cleaned, lubricated and adjusted to specified standards.
	2.4	Equipment/component abnormalities are identified and appropriate remedial action is taken to ensure equipment conforms and performs to technical specifications.
	2.5	Installation and maintenance is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.6	Equipment faults and/or damage to equipment are identified using efficient fault finding and diagnostic techniques, including fault indicators, error codes and maintenance records.
	2.7	Equipment faults and/or damage to equipment are identified using efficient fault finding and diagnostic techniques, including fault indicators, error codes and maintenance records.
	2.8	Installation and maintenance are performed using appropriate tools and test equipment to ensure signalling equipment operates to required technical and operational standards.
	2.9	Faulty, worn, damaged or insecure components are replaced, repaired or secured to conform to manufacturers and workplace requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Fault finding and repairs are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.12	Equipment is tested and adjusted using appropriate test equipment and procedures to ensure it operates within the specified technical parameters.

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ELEMENT	PERFORMANCE CRITERIA	
	2.13	Level crossing lamp alignments are carried out as part of the testing and adjusting procedures where appropriate.
3 Complete the installation and maintenance of active level crossing equipment	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Equipment is taken out of service/brought back into use as appropriate, and required documentation is completed to conform to workplace requirements.
	3.3	Documentation required by the organisation is completed to ensure accurate maintenance records are maintained, and relevant reports produced.
	3.4	Work site/equipment is reinstated to organisation requirements and faulty components are tagged, recorded and despatched for repair/replacement.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining active level crossing equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN107A Active level crossing equipment installation and maintenance

Evidence shall show an understanding of active level crossing equipment installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Rail signalling, active level crossing equipment

Servicing procedures encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled / preventative maintenance

Unscheduled / corrective maintenance

Certifying power supply equipment (commission and de-commission).

Note:

Certifying procedures are only applicable for compliance with rail operator and/or enterprise standards.

Equipment and their components encompassing:

Flashing lights

Audible warning devices

Boom gate/barrier

Pedestrian gate/barrier

Relay operation

Crossing predictor

Operation alarm monitoring

Traffic light interfaces.

Operating principles and parameters encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

Single line control

Double line control

Special controls

Processor controls

Remote alarm monitoring

Failure modes

Emergency operation

Interpreting circuits diagrams to evaluate correct operation and relationship to other signalling circuits

Correct operation in accordance with control and locking tables.

Servicing procedures encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled/preventative maintenance

Unscheduled/corrective maintenance

Certification of active level crossing equipment (commission/ de-commission).

Note:

Certifying procedures are only applicable for compliance with rail operator and/or enterprise standards.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain active level crossing equipment as described in 8) and including:

    a. Interpreting specifications correctly

    b. Using appropriate fault finding techniques

    c. Maintaining electrically-operated level crossing equipment to operational requirements

    d. Organising work to minimise road and rail traffic

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disruptions

e. Using tools correctly
f. Following relevant codes of practice, OHS and environmental protection procedures and requirements
g. Completing relevant technical reports, records and documentation, and
h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining power signalling and protected level crossing equipment and repairing faults.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN109A Install and maintain train detection equipment

UEENEEN105A Install and maintain rail signalling power supplies

UEENEEN118A Find and repair rail signal system faults

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Equipment relevant to a particular rail network.
- Code of practice for the defined interstate rail network.

Activities may include: procedures for maintenance and repair of protected level crossing equipment on rail networks and may also include' safe working, the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Maintenance activities may also incorporate safe working, working according to regulatory requirements and following work procedures, performing scheduled maintenance, finding and repairing faults, performing operational tests and completing reporting documentation.

Plant may include; elevated Work Platforms, portable generators and or crane truck

Electrical equipment may include; cross arms, bells, control and protection equipment, remote monitoring equipment, relay control, static flashers, electro-mechanical boom equipment, electro-mechanical pedestrian equipment, audible warning devices, power off indicators, flashing lights, current sensing devices, grade crossing predictors, solid state crossing controllers and road traffic control

Mechanical equipment may include; boom and flashing light mast, boom arm and counter weights and or pedestrian gates/booms.

Technical report may include: level crossing incident report, level crossing accident report, site survey and log report.

Test equipment may include; multimeters, laptop computer and peripherals, audio test meters

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN108A Install and maintain power operated point actuating devices

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers installation and maintenance of power point actuating devices in rail networks. It encompasses safe working, regulatory requirements and following installation and work procedures, performing scheduled maintenance, finding and repairing faults, performing operational tests and reporting.

Application of the Unit

Application of the Unit

2)

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 109A	Install and maintain train detection equipment.

AND

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install and maintain power operated point actuating devices	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	The extent of the installation and/or maintenance is determined from maintenance schedules, job specifications, drawings and regulatory requirements
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
		1.5	Materials needed for the installation and/or maintenance are obtained in accordance with established procedures and checked against job requirements
		1.6	Tools, equipment and testing devices needed for the installation and/or maintenance and repair work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Install and maintain power operated point actuating devices	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Maintenance work including cleaning, brushing and lubricating is carried out on point actuating devices to ensure technical and operational

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ELEMENT	PERFORMANCE CRITERIA	
		specifications are met.
	2.3	Adjustments to point actuating devices are made to ensure correct operation and perway fastenings and timbers are inspected for conformity to specifications.
	2.4	The position and mounting of point actuating devices are checked to ensure conformity to site layout specifications.
	2.5	Installation and maintenance is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.6	The correct function of the equipment is established from appropriate technical data and equipment operating procedures and maintenance handbooks.
	2.7	Faulty, worn, damaged or insecure components are replaced, repaired or secured to conform to technical and manufacturers specifications to ensure operational effectiveness.
	2.8	The equipment is tested using approved testing procedures and equipment to ensure operational and technical requirements are achieved.
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Complete the installation and maintenance of power operated point actuating devices	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Appropriate documentation is accurately completed to provide an accurate installation and maintenance records database and inform train control of work status details.
	3.3	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate

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ELEMENT	PERFORMANCE CRITERIA	
		spares.
	3.4	Faulty Perway conditions/components are documented to provide details for corrective action.
	3.5	Point actuating devices are temporarily taken out of service, instated back into service and certified as appropriate to organisation requirements and procedures.
	3.6	Maintenance work activities are recorded as per organisation requirements to provide accurate records, and relevant reports produced.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining power operated point actuating devices.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN108A Power operated point actuating device installation and maintenance

Evidence shall show an understanding of power operated point actuating device installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Rail signalling principles, electrical

Overview of electrical rail signalling encompassing:

Types of rail signalling / safeworking systems

Note:

Systems include: CTC, automatic, controlled and interlocked signalling.

Advantages of electrical over mechanical signalling

Advantages of CBI over electrical signalling systems

Effects of overhead traction systems on electrical signalling systems (where applicable).

Purpose of elements of an electrical rail signalling systems.

Note: Elements include signals and aspect systems, train protection systems, point actuating systems, mechanical locking, relay interlocking, computer based interlocking, train detection systems, control input devices, indicators, diagrams and monitors, and safe working systems.

Rail signalling principles, mechanical

Overview of mechanical rail signalling encompassing:

Types of mechanical rail signalling systems for different rail traffic

Note:

Rail traffic may include: passenger train, freight train, maintenance vehicles, heritage/tourism train.

Deficiencies of mechanical signalling systems

Note:

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REQUIRED SKILLS AND KNOWLEDGE

Mechanical systems may include: automatic, controlled and interlocked signalling.

Effects of overhead traction systems on mechanical signalling systems (where applicable)

Effects of external factors on the mechanical rail signalling system.

Note:

Factors may include: rail overhead , gradients/terrain, environmental and civil configuration.

Purpose of elements of a mechanical rail signalling systems.

Note: Elements include signals, point actuating systems, locking and train detection systems, control input devices, indicators, diagrams and monitors, mechanical interlocking frames, safe working systems and electro-mechanical interfaces.

Rail signalling, point actuating devices

Equipment and their components encompassing:

Point actuating mechanisms

Note:

mechanisms include mechanical, pneumatic, hydraulic and electric powered units

Blade and operation detection devices

On-rail locking devices

Off-rail locking devices

Swing nose devices

Ironwork and fixtures.

Note: Equipment include point machines, detectors, claw/clamp locks, swing nose mechanisms, in-bearer mechanisms

Operating principles encompassing:

Point operation, normal and reverse

Point locking, normal and reverse

Point detection, normal and reverse

Detectors

Off-rail locking operation

On-rail locking operation

Electric operation of contactors, motor control and detection circuits

Interpreting circuit diagrams to evaluate correct operation and relationship to other signalling circuits

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REQUIRED SKILLS AND KNOWLEDGE

Normal mechanical movement

Failure mode mechanical movement

Note:

Failure mode must include wrong side and right side conditions identifying if movement should be possible.

Correct operation in accordance with control and locking tables.

Servicing procedures encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled / preventative maintenance

Unscheduled / corrective maintenance

Certifying point equipment (commission and de-commission).

Note:

Certifying procedures are only applicable for compliance with rail operator and/or enterprise standards.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain power operated point actuating devices as described in 8) and including:

  a. Interpreting plans and specifications correctly
  b. Maintaining point actuating devices to operational requirements
  c. Using appropriate fault finding techniques
  d. Documenting Perway defects accurately
  e. Using tools correctly
  f. Following relevant codes of practice, OHS and environmental protection procedures and requirements
  g. Completing relevant technical reports, records and documentation, and
  h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining on site power operated point-actuating devices.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency

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development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN118A Find and repair rail signal system faults

UEENEEN105A Install and maintain rail signalling power supplies

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Equipment relevant to a particular rail network.
- Code of practice for the defined interstate rail network.

Activities may include: procedures for maintenance of power point actuating devices in rail networks and may also include; the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Installation activities on power point actuating devices may also include: changing hand of the point mechanism, internal wiring configuration.

Maintenance activities on power point actuating devices may also incorporate safe working, working according to regulatory requirements and following work procedures, performing scheduled maintenance, repairing point actuating devices, test and verifying the integrity of the maintenance work and completing report documentation.

Plant may include: backhoe; crane truck, boring machine and or mechanical cutting/bending equipment (e.g. welding equipment, disk saws, etc)

Electrical equipment may include: motors, electro-mechanical clutches, electro-hydraulic pumps/solenoids, electro-pneumatic solenoids, detection switches and contactors

Mechanical equipment may include: point mechanisms, pistons and rams, locking mechanisms (off-rail or on-rail), mechanical detection mechanisms (off-rail or on-rail), mechanical rodding, spreaders and blade chairs

Technical report may include: incident report, Electrical Access report, site survey and log report

Test equipment may include: multimeter, tong meter, hydraulic pressure gauges and pneumatic pressure gauges

Specialised equipment, tools and devices may include: specialise point tolerance gauges.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN109A Install and maintain train detection equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and maintenance of train detection equipment in a rail network. It encompasses safe working, regulatory requirements and following installation and work procedures, performing maintenance, finding and repairing faults, performing operational tests, certifying and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 105A	Install and maintain rail signalling power supplies

AND

UEENEEN 103A	Install and maintain rail track circuit leads and bonds

AND

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and maintain train detection equipment	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of the installation and/or maintenance is determined from maintenance schedules, job specifications, drawings and regulatory requirements
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Materials needed for the installation and/or maintenance work are obtained in accordance with established procedures and checked against job requirements
	1.6	Tools, equipment and testing devices needed for the installation and/or maintenance work are obtained in accordance with established procedures and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Install and maintain train detection equipment	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Installation and maintenance work is carried out to manufacturer specifications using procedures consistent with delegated authority.
	2.3	Normal function and operating parameters are confirmed using appropriate manuals, specifications and commissioning data.
	2.4	Fault finding and diagnostic techniques are completed to verify system/faults.
	2.5	Faulty, damaged or insecure components are replaced, repaired or secured in accordance with manufacturer specifications and organisation procedures.
	2.6	Installation and maintenance, adjusting and testing work is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.7	Appropriate readings are measured and recorded using relevant test instruments.
	2.8	Equipment is tested and adjusted in accordance with the specifications.
	2.9	Equipment operational tests are completed to specifications and procedures.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Complete the installation and maintenance of train detection equipment	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Correct calibration of equipment is verified and equipment is confirmed as fulfilling functional tests in accordance with organisation

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ELEMENT	PERFORMANCE CRITERIA	
		certification procedures.
	3.3	Work completion is documented and appropriate persons notified in accordance with established procedures, and relevant reports produced

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining train detection equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN109A Train detection equipment installation and maintenance

Evidence shall show an understanding of train detection equipment installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Rail signalling, train detection equipment

Train detection equipment and their components encompassing:

Track circuits

Note:

Types may include jointed, jointless, non-vital, axle counters, treadles and level crossing predictors.

AC and DC power supplies

Transmitters

Receivers

Relays

Track Shunts

Tuned joint couplers

Central processor

Diagnostics

Fixtures to ironwork.

Operating principles and parameters encompassing:

Interpreting circuits diagrams to evaluate correct operation and relationship to other signalling circuits

Normal mode operation

Note:

Normal mode includes instantaneous coil energisation and delay pickup.

Wrong side operation

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REQUIRED SKILLS AND KNOWLEDGE

Failure mode operation

Note:

Failure mode must include wrong side and right side conditions.

Alarm mode

Redundancy mode

Correct operation in accordance with control and locking tables.

Servicing procedures encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled /preventative maintenance

Unscheduled/corrective maintenance

Certification of train detection equipment (commission and de-commission).

Note:

Certifying procedures are only applicable for compliance with rail operator and/or enterprise standards.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9.1)**
	Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships.

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However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the time frames typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain train detection equipment as described in 8) and including:

  a. Interpreting plans and specifications correctly
  b. Installing, maintaining, adjusting and testing equipment in accordance with workplace procedures
  c. Using tools and test equipment safely
  d. Checking that technical operational specifications are met and that equipment is in compliance with work orders
  e. Following relevant codes of practice OHS and environmental protection procedures and requirements
  f. Completing relevant technical reports, records and documentation, and
  g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining track circuit equipment and repairing faults.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency

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development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN105A Install and maintain rail signalling power supplies

UEENEEN118A Find and repair rail signal system faults

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Equipment relevant to a particular rail network.
- Code of practice for the defined interstate rail network.

Activities may include: procedures for maintenance of track circuit equipment in a rail networks and may also include; the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Maintenance activities may include: finding and repairing faults on track circuit equipment in a rail network and may also incorporate safe working, working according to regulatory requirements and following work procedures, adjust, test and verifying operational integrity and completing report documentation.

Electrical equipment may include: power supplies, receivers, relays, transmitters, matching units/tuning units, axle counters and peripherals, impedance bonds and track filters

Mechanical equipment may include: insulated Rail Joints (IRJs) and treadles.

Technical report may include: incident report, track survey and log report

Test equipment may include: multimeters, frequency meters, integration attachments, impedance tester, insulation resistance and continuity tester, track shunt devices, current sensing devices.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN110A Install and maintain non-vital telemetry systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation and maintenance of non-vital telemetry equipment and systems in a rail network. It encompasses safe working, regulatory requirements and following installation and work procedures performing scheduled maintenance, finding and repairing faults, testing telemetry equipment, certifying and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101 A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

And

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install and maintain non-vital telemetry systems	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented
		1.4	The normal function of the equipment is established through reference to operating manuals, systems, specifications and operators interface.
		1.5	Materials needed to install and maintain non-vital telemetry systems are obtained in accordance with system specifications and established procedures.
		1.6	Tools, equipment and testing devices needed to install and maintain non-vital telemetry systems and diagnose the fault are obtained in accordance with established procedures and checked for correct operation and safety.
2	Install and maintain non-vital telemetry systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Installation and maintenance work are carried out to manufacturer specifications using procedures consistent with delegated authority

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Normal function and operating parameters are confirmed using appropriate manuals, specifications and the operators interface.
	2.4	Fault finding and diagnostic techniques are completed using circuit diagrams and manufacturer specifications to verify system/faults.
	2.5	Faulty, damaged or insecure components are replaced, repaired or secured in accordance with manufacturer specifications and organisation procedures.
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.7	Installation and maintenance work is carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.8	Faults are diagnosed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.9	The fault is isolated and assessed to determine the most appropriate repair method, tools, and test and measurement instruments to be used.
	2.10	Faulty, damaged or insecure components are replaced, repaired, or secured to manufacturer/technical specifications and the equipment is returned to service.
	2.11	Parts/components requiring repairs beyond the repair capacity of the service centre are dispatched for external repairs or disposed of in accordance with the organisation procedures.
	2.12	Parts/components identified as suitable for replacement are replaced from available parts/component resources.
	2.13	Faults are rectified efficiently without waste of

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ELEMENT	PERFORMANCE CRITERIA	
		materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.14	Repaired/replaced equipment is tested using approved test equipment in accordance with appropriate test procedures to ensure equipment is fully operational.
	2.15	All test equipment used is checked to ensure it is within calibration standards.
	2.16	All appropriate adjustments and calibrations are carried out to the specified settings and values.
3 Complete the installation and maintenance of non-vital telemetry systems	3.1	OHS work completion risk control measures and procedures are followed.
		Required documentation is completed, including confirmation that equipment has been repaired to manufacturer specifications and relevant reports produced.
		Arrangements are made for the safe return of equipment to the customer and in accordance with workplace procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and the installation and maintenance of non-vital telemetry systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN110A Non-vital telemetry systems installation and maintenance

Evidence shall show an understanding of non-vital telemetry systems installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Electronic switching encompassing:

Devices and used for electronic switching and their switching characteristic

Circuit configuration and switch-on, switch-off conditions

Faults in electronic switching devices/circuits

Typical applications of electronic switching

Using supervisory control and data acquisition systems encompassing:

SCADA system features and applications:

Industries in which SCADA systems are used and

Associate benefits of the package.

Features and facilities of different SCADA packages.

Hardware requirements

Transmission protocols encompassing:

Carriers

multidrop configuration

Time division multiplexing

relay and CBI interfaces

data structure

Note: Elements include: addressing, parity, cyclic redundancy check, direction control data, indication data.

Reading mimics and animated graphics

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REQUIRED SKILLS AND KNOWLEDGE

Trending:

Analysis of process to select data,

Viewing data and graphical representation of selected information

Trend graphs and data matching

Alarm logging:

Analysing select data,

Corrective action of alarm status

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being

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assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the time frames typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain non-vital telemetry systems as described in 8) and including:

  a. Interpreting plans and specifications correctly,
  b. Installing, maintaining and testing of non-vital telemetry equipment in accordance with workplace procedures
  c. Using effective and efficient diagnostic fault finding techniques,
  d. Using resources efficiently,
  e. Repairing equipment in accordance with workplace procedures,
  f. Ensuring repaired equipment conforms to manufacturers specifications,
  g. Calibrating and using test equipment and tools correctly,
  h. Following relevant codes of practice, environmental protection procedures and requirements, and
  i. Following correct liaison procedures
  j. Completing relevant technical reports records and documentation, and
  k. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining electronic signalling and communication equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN118A Find and repair rail signal system faults

UEENEEN114A Install and maintain computer based interlocking systems

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Equipment relevant to a particular rail network.
- Code of practice for the defined interstate rail network.

Activities may include: procedures for maintenance of electronic signalling and communication equipment and may also include; the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Maintenance activities may include: repairing faults in electronic signalling and communications systems in a rail network and may also incorporate safe working, diagnosing and rectifying system faults, repair and replacing faulty equipment and following work procedures. It may also include calibrating and testing as well as reporting work activities.

Electronic equipment may include: computers and associated peripherals, network switches, modems, control systems, including electronic cards, software and firmware, cabling and associated connectors, including fibre optical, coaxial, and shielded/screened and CAT 5, input/output interfacing devices and surge protection.

Test equipment may include: laptop computer and peripherals and multimeter.

Technical report may include: incident report, data log report

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN111A Install and maintain trackside signal and train protection equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers installation and maintenance of trackside signal and train protection equipment. It encompasses safe working, regulatory requirements and following installation and work procedures, performing scheduled maintenance, finding and repairing faults, performing operational tests, certifying and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the 'Code Of Practice for the Defined Interstate Rail Network' for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 109A	Install and maintain train detection equipment

AND

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to install and maintain trackside signal and train protection equipment	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		1.4	Appropriate personnel are consulted to ensure the work can proceed without delaying or compromising the operational safety of train movements.
		1.5	Materials needed for the installation/maintenance work are obtained in accordance with established procedures and checked against job requirements
		1.6	Tools, equipment and testing devices needed for the installation/maintenance work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Install and maintain trackside signal and train protection equipment	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Signal and train protection equipment is checked

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ELEMENT	PERFORMANCE CRITERIA	
		to confirm technical specifications can be met.
	2.3	Sub assemblies of signal and train protection equipment are assembled in accordance with work specifications and checked to confirm circuit integrity.
	2.4	Complete sub assemblies are tested off site where possible to ensure technical operations can be met.
	2.5	Installation, wiring and assembly of signal and train protection equipment is done efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.6	Signal and train protection components and sub assemblies are checked and installed in accordance with job specifications.
	2.7	Component and wiring test are performed to ‘live test’ conditions to ensure and train protection equipment functions correctly.
	2.8	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.9	Installation and maintenance work are carried out to manufacturer specifications using procedures consistent with enterprise standards.
	2.10	Appropriate operational test procedures are applied to ensure equipment and components are fully operational
	2.11	Signal and train protection equipment is monitored and tested to ensure it operated within the technical parameters specified.
	2.12	Testing is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete the installation and maintenance of trackside signal and train protection equipment	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Test results and documentation is completed to confirm operational compliance to system requirements and job specifications, and relevant reports produced.
	3.4	Work completion is documented and appropriate person(s) notified in accordance with established procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining trackside signal and train protection equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN111A Trackside signal and train protection equipment installation and maintenance

Evidence shall show an understanding of trackside signal and train protection equipment installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Rail signalling principles, electrical

Overview of electrical rail signalling encompassing:

Types of rail signalling / safeworking systems

Note:

Systems include: CTC, automatic, controlled and interlocked signalling.

Advantages of electrical over mechanical signalling

Advantages of CBI over electrical signalling systems

Effects of overhead traction systems on electrical signalling systems (where applicable).

Purpose of elements of an electrical rail signalling systems.

Note: Elements include signals and aspect systems, train protection systems, point actuating systems, mechanical locking, relay interlocking, computer based interlocking, train detection systems, control input devices, indicators, diagrams and monitors, and safe working systems.

Rail signalling principles, mechanical

Overview of mechanical rail signalling encompassing:

Types of mechanical rail signalling systems for different rail traffic

Note:

Rail traffic may include: passenger train, freight train, maintenance vehicles, heritage/tourism train.

Deficiencies of mechanical signalling systems

Note:

Mechanical systems may include: automatic, controlled and interlocked signalling.

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REQUIRED SKILLS AND KNOWLEDGE

Effects of overhead traction systems on mechanical signalling systems (where applicable)

Effects of external factors on the mechanical rail signalling system.

Note:

Factors may include: rail overhead , gradients/terrain, environmental and civil configuration.

Purpose of elements of a mechanical rail signalling systems encompassing:

Note: Elements include signals, point actuating systems, locking and train detection systems, control input devices, indicators, diagrams and monitors, mechanical interlocking frames, safe working systems and electro-mechanical interfaces.

Rail signalling, signal equipment

Equipment and their components encompassing:

Incandescent lamps

LED lamps

Electro-Mechanical

Mechanical.

Note:

Including interfacing to different interlocking systems, E.g. relay and CBI

Operating principles and parameters encompassing:

Automatic signal control circuits

Controlled signal control circuits

Approach control circuits

Bi-directional block control circuits

Lamp proving circuits

Failure mode

Interpreting circuits diagrams to evaluate correct operation and relationship to other signalling circuits

Correct operation in accordance with control and locking tables.

Servicing procedures encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled/corrective maintenance

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REQUIRED SKILLS AND KNOWLEDGE

Unscheduled/preventative maintenance

Certifying signal equipment (commission and de-commission).

Note:

Certifying procedures are only applicable for compliance with rail operator and/or enterprise standards.

Rail signalling, train protection equipment

Equipment and their components encompassing:

Electro-mechanical (E.g. trainstops)

Electro-magnetic (E.g. AWS)

Electronic (E.g. TPWS)

ATP system - Balise/beacon based (E.g. ETCS Level 1, and Westect).

Note: include concept of interface to on-board system.

Operating principles encompassing:

Permissive operation

Restrictive operation

Failure modes

Interpreting circuits diagrams to evaluate correct operation and relationship to other signalling circuits

Correct operation in accordance with control and locking tables.

Servicing procedures and parameters encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled/preventative maintenance

Unscheduled/corrective maintenance

Certifying train protection equipment (commission and de-commission).

Note:

Certifying procedures are only applicable for compliance with rail operator and enterprise standards.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain power operated trackside signal and train protection equipment as described in 8) and including:

  a. Interpreting specifications and circuit diagrams correctly

  b. Using appropriate fault finding techniques

  c. Installing and maintaining trackside signal and train protection equipment to operational requirements

  d. Organising work to minimise traffic disruptions

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e. Using tools and test equipment correctly
f. Following relevant codes of practice and environmental protection procedures and requirements
g. Completing relevant technical reports and documentation, and
h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and maintaining power operated signalling equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3

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'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN118A Find and repair rail signal system faults

UEENEEN114A Install and maintain computer based interlocking systems

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Equipment relevant to a particular rail network.
- Code of practice for the defined interstate rail network.

Activities may include: procedures for the installation and maintenance of trackside signal and train protection equipment and may also include; the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Maintenance activities may include: finding and repairing faults on signals and train protection equipment in a rail network and may also incorporate safe working, working according to regulatory requirements and following work procedures, adjust, test and verifying operational integrity and completing report documentation.

Installing equipment may include: components and wiring as well as connecting, checking and testing wiring and equipment.

Plant may include: elevated work platforms and crane trucks

Electrical equipment may include: searchlight signal indicating devices, LED signal indicating devices, incandescent signal indicating devices, electro-mechanical rail traffic protection devices, and electronic rail traffic protection devices.

Mechanical equipment may include: signal masts

Test equipment may include: multimeter, frequency meter and rail traffic protection gauges

Technical report may include: Signal passed at danger incident report, site survey and data log report

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN112A Install and maintain vital relay interlocking systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and maintenance of vital relay interlocking systems in a rail network. It encompasses safe working, regulatory requirements and following installation and work procedures, performing schedules maintenance, diagnosing and repairing system faults, performing operational tests and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 107A	Install and maintain active level crossing equipment

AND

UEENEEN 108A	Install and maintain power operated point actuating devices

AND

UEENEEN 111A	Install and maintain power operated trackside signal and train protection equipment

AND

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

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Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and maintain vital relay interlocking systems	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of installation and/or maintenance work is determined from job specifications, drawings and regulatory requirements
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others to minimise traffic disruptions.
	1.5	Materials needed installation and/or maintenance work are obtained in accordance with established procedures and checked against job requirements
	1.6	Tools, equipment and testing devices needed for installation and/or maintenance work are obtained in accordance with established procedures and checked for correct operation

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ELEMENT	PERFORMANCE CRITERIA	
		and safety.
2 Install and maintain vital relay interlocking systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Visual inspection or installation wiring and equipment is carried out to identify damaged or faulty equipment.
	2.3	Damaged or faulty components identified from visual inspection are replaced as per technical instructions, manufacturer specifications and maintenance procedures.
	2.4	Installation and maintenance is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.5	OHS risk control measures and procedures for carrying out the work are followed.
	2.6	Systems are investigated using appropriate fault finding and diagnostic techniques to identify faults.
	2.7	Fault indicators and maintenance records are used to assist in the identification of faults
	2.8	Repairs, replacement and/or adjustment of equipment/systems are carried out using appropriate tools and test equipment to ensure equipment/systems function to required technical and operational standards.
	2.9	Faulty, worn, damaged or insecure components are repaired, replaced or secured whilst ensuring system safety integrity is maintained and technical / manufacturers requirements are met.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	The system is tested using approved test procedures and equipment to ensure it operates

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ELEMENT	PERFORMANCE CRITERIA	
		within specified technical parameters.
3 Complete the installation and maintenance of vital relay interlocking systems	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty, worn components are tagged and dispatched for repair to maintain adequate spares.
	3.3	Maintenance work activities are recorded as per organisation requirements to provide accurate records
	3.4	Documentation including component faults, test results, authorisations and permits is completed to provide an accurate database and facilitate follow up action, and relevant reports produced.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining vital relay interlocking systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN112A Vital relay interlocking systems installation and maintenance

Rail signalling, interlocking systems, electrical

Equipment and their components encompassing:

Power supplies

Relays, timer

Relays, latching/delatching

Relays, line

Relays, biased

Signaller controls/indications

Geographic modules

Mechanical interface.

Operating principles and parameters encompassing:

Normal mode operation

Route selection circuits

Signal approach circuits and timers

Point release circuits and timers

Panel indications and circuits

Wrong side protection mode

Alarm mode

Emergency operation

Correct operation in accordance with control and locking tables.

Servicing procedures encompassing:

Maintenance documentation

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REQUIRED SKILLS AND KNOWLEDGE

Coordination/planning sequence

Operational test procedures

Scheduled/preventative maintenance

Unscheduled/corrective maintenance

Certifying interlocking equipment (commission and de-commission).

Note:

Certifying procedures are only applicable for compliance with rail operator and/or enterprise standards.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may

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be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

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licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain power vital relay interlocking systems as described in 8) and including:

  a. Interpreting plans and specifications correctly,
  b. Using appropriate fault finding techniques,
  c. Installing and maintaining vital relay interlocking systems to operational requirements,
  d. Organising work to minimise rail traffic disruptions,
  e. Using tools correctly,
  f. Following relevant codes of practice, OHS and environmental protection procedures and requirements
  g. Completing relevant technical reports, records and documentation, and
  h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining power signalling and protective relay interlocking systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN118A Find and repair rail signal system faults

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Equipment relevant to a particular rail network.
- Code of practice for the defined interstate rail network.

Activities may include: procedures for maintenance of vital relay interlocking equipment in a rail networks and may also include; the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Maintenance activities may include: finding and repairing faults on vital relay interlocking equipment in a rail network and may also incorporate safe working, working according to regulatory requirements and following work procedures, adjust, test and verifying operational integrity and completing report documentation.

Electrical equipment may include: power supplies, isolation links, fuses, electro-mechanical vital relays, mechanical timer relays, electronic timer relays, wiring, relay spring clips, multi core signal copper cables, earth detection devices.

Mechanical equipment may include: relay mounting bases, relay coding pins,

Test equipment may include: multimeters, insulation resistance and continuity tester, stop watches, test lamps, relay delatch bases.

Technical report may include: incident report, site survey and data log report.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN114A Install and maintain computer based interlocking rail systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the installation and maintenance of computer based electronic equipment for rail network signalling system. It encompasses safe working, regulatory requirements and following work procedures monitoring system, responding to fault information, and replacing faulty equipment.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 107A	Install and maintain active level crossing equipment
UEENEEN 108A	Install and maintain power operated point actuating devices
UEENEEN 111A	Install and maintain power operated trackside signal and train protection equipment

AND

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	Writing	Numeracy

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills **5)**

will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install and maintain computer based interlocking equipment	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of installation and/or maintenance work is determined from job specifications, drawings and regulatory requirements
	1.4	Materials needed for the installation and/or maintenance work are obtained in accordance with established procedures and checked against job requirements
	1.5	Tools, equipment and testing devices needed for the installation and/or maintenance work are obtained in accordance with established procedures and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Install and maintain computer based interlocking systems	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Up-to-date reports or fault logs are gained by accessing the diagnostic terminal
	2.3	Fault correction activities are prioritised by reviewing the fault reports and corrective actions are implemented
	2.4	Records of previously actioned faults are deleted/cleared from the terminal
	2.5	The source of the fault is correctly identified by assessing the diagnostics terminal
	2.6	The corrective action required is determined and implemented
	2.7	Appropriate mechanisms for the safe and efficient rectification of the fault are ensured
	2.8	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.9	System monitoring is conducted efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.10	The correct replacement equipment is obtained from spare stock to comply with identified fault repair requirements
	2.11	Faulty component/equipment is correctly identified and removed as per organisation practices and procedures
	2.12	Replacement component equipment is correctly installed, connected and powered up as per manufacturer specifications
	2.13	Correct test procedures are identified and implemented to confirm all operations are within specifications

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ELEMENT	PERFORMANCE CRITERIA	
	2.14	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.15	Equipment operations are monitored to ensure system integrity
	2.16	Signal and voltage levels are monitored, checked and adjusted if required to ensure compliance with operational requirements
	2.17	Complete statistical records and equipment/operational management information is accurately recorded and maintained to support ongoing monitoring of systems and equipment performance
3 Complete the installation and maintenance of computer based interlocking systems	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Non conforming equipment is identified and tagged for repair type and extent of fault is identified and recorded as required
	3.3	Faulty equipment requiring repair is segregated and appropriate records are completed in preparation for dispatch to repairer
	3.4	Spare equipment stocks are reviewed to ensure adequate availability
	3.5	Priority for repair or replacement of equipment is established by evaluation of stock levels and fault logs
	3.6	Work completion is documented and appropriate personnel notified of repair and replacement priorities in accordance with established procedures, and relevant reports produced

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintain computer based interlocking equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN114A Computer based interlocking systems installation and maintenance

Evidence shall show an understanding of computer based interlocking systems installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Electronic communications, principles encompassing:

- Requirements of a basic communications system - satellites, data communications, navigation, telecommunications, noise etc
- Antennae and electromagnetic wave propagation
- Reason for modulation
- Amplitude and frequency modulation, difference, advantages and disadvantages
- Simple transmitter and receiver circuits (Block diagram level)
- Optical communications principles

T2. Rail signalling, electronic equipment encompassing:

- Equipment and their components - telemetry (SCADA), monitoring systems, IASS, train describer, panel processors,
- Operating principles and parameters
- Servicing procedures.

T3. Computer peripherals encompassing:

- Types and applications
- Operating principles
- Software (drivers) installation
- Network management of peripheral devices.

T4. Personal computers, engineering applications software basic encompassing:

- Application software types
- Configurations and preferences
- Use of particular software packages - word processor, spreadsheet, database, presentation software, web/document publisher, CAD/drawing packages, email client, business management

T5. Rail signalling, computer-based interlocking encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- Equipment and their components - solid state interlocking (SSI), Microlock, Westrace
- Operating principles and parameters
- Servicing procedures.

T6. Rail signalling, computer applications encompassing:

- Types of software and their scope - interrogator software for loggers, monitors and computer based interlocking, data base (work instruction, commissioning work structures, and cable schedules.
- Setting up and use.

T7. Rail signalling, remote control systems encompassing:

- Equipment and their components - PLC, dedicated PCs, prep. systems
- Operating principles and parameters
- Servicing procedures.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

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Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement

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- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install and maintain computer based interlocking systems as described in 8) and including:

  a. Maintaining computer based and solid state interlocking equipment to operational requirements, plans and specifications
  b. Interpreting specifications and plans correctly
  c. Using appropriate testing and fault finding techniques
  d. Rectifying faults with minimal disruption to rail traffic and services
  e. Using tools and test equipment correctly
  f. Following relevant codes of practice, OHS and environmental protection procedures requirement
  g. Completing relevant technical reports, records and documentation, and
  h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a

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workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining computer based and solid state interlocking systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance functions.

Concurrent assessment may include:

UEENEEN118A Find and repair rail signal system faults

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Equipment relevant to a particular rail network.
- Code of practice for the defined interstate rail network.

Activities may include: procedures for maintenance of computer based interlocking equipment in a rail networks and may also include; the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Maintenance activities may include: finding and repairing faults on computer based interlocking equipment in a rail network and may also incorporate safe working, working according to regulatory requirements and following work procedures, adjust, test and verifying operational integrity and completing report documentation.

Electrical equipment may include: power supplies, indications, processor cards or modules, vital relays, input cards or modules, output cards or modules, non-vital interface cards or modules, diagnostic card or module, EPROMs, modems, network interface equipment

Mechanical equipment may include: mounting bases, clips, cable connectors.

Diagnostic equipment may include: hand held terminals, laptops, personal computers, printers, fault indications, healthy state indications, alarm messages.

Technical report may include: incident report, signal passed at danger report and data log report.

Test equipment may include: multimeters, frequency meters, impedance tester, insulation resistance and continuity tester, current sensing devices.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN116A Maintain electronic and microprocessor-based remote control systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers maintain operational status of electronic and microprocessor based remote control system for a rail network signalling system. It encompasses safe working, regulatory requirements and following work procedures, including co-ordinating and fault finding and repairs, inspecting and rectifying defects, analysing and determining the cause of faults, rectifying faults and recording.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried

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License to practice **3)**

out on that network.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN106A	Install and maintain non-vital screen based rail control systems
UEENEEN110A	Install and maintain non-vital telemetry systems
UEENEEN118A	Find and repair rail signalling system faults

And

Relevant work place requirements in ‘Work site protection’ have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills	**5)**
	This unit contains Employability Skills
	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to maintain electronic and microprocessor-based remote control system	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	Maintenance programs/fault/irregularity reports are reviewed to establish work priorities, resources, logistics and site information
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others affected by the work and authorisations are obtained in accordance with established procedures.
		1.5	Materials needed for the work are obtained in

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ELEMENT		PERFORMANCE CRITERIA	
			accordance with established procedures and checked against job requirements
		1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Maintain electronic and microprocessor-based remote control system	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Visual inspection is carried out and all equipment checked to ensure performance is in accordance with operational specifications
		2.3	Security of fittings, terminations and mountings are checked for conformance with specifications and adjusted accordingly
		2.4	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.5	Maintenance work is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
		2.6	Appropriate operating parameters are ascertained from specifications and commissioning data to enable performance checked to be completed
		2.7	Appropriate diagnostic techniques are employed to verify symptoms or irregularities
		2.8	Symptoms are reproduced, monitored and documented where appropriate
		2.9	System is adjusted and operationally tested to technical parameters and design specifications
		2.10	Appropriate conclusions are drawn from fault indicators, error codes, maintenance records and print outs to assist fault finding

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ELEMENT		PERFORMANCE CRITERIA	
		2.11	Appropriate technical support is obtained if required
		2.12	Faulty components are replaced or repaired in accordance with workplace procedures
		2.13	Components are terminated, connected, system levels adjusted and parameters set in accordance with specifications
3	Complete maintenance of electronic and microprocessor-based remote control system and report	3.1	OHS completion risk control work measures and procedures are followed.
		3.2	System is functionally tested to specified parameters
		3.3	Maintenance documentation is completed as required and equipment is labelled, packaged and returned to service where appropriate

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and maintaining electronic and microprocessor-based remote control systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN116A Rail signalling remote control system maintenance

Evidence shall show an understanding of rail signalling electronics and microprocessor based remote control system maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Maintenance principles encompassing:

maintenance function

role of maintenance department

occupational health and safety requirements

Maintenance systems encompassing:

maintenance terminology

preventative maintenance

predictive maintenance

corrective maintenance

Data acquisition encompassing:

plant history cards/files

inspection techniques

predictive maintenance

remote visual inspection

non-destructive testing

thermography

vibration analysis

oil analysis

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REQUIRED SKILLS AND KNOWLEDGE

Rail signalling maintenance plans encompassing:

characteristics

maintenance windows

required resources (labour and materials)

procedures and records

Maintenance of rail signalling electronics and microprocessor based remote control systems

(list components requiring maintenance)

Rail safe working practices encompassing:

Rail enterprise safety standard and procedures

Rail safe working requirements

Possessions protection and management

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency

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in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the time frames typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control

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measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Maintain electronic and microprocessor-based remote control systems as described in 8) and including:

  a. Interpreting specifications, circuit diagrams and workplace procedures correctly
  b. Using appropriate diagnosis and fault finding techniques to sub-module level
  c. Maintaining electronic switched and microprocessor-based remote control systems to operational requirements (to sub module level)
  d. Working efficiently and effectively
  e. Using tools and test equipment correctly
  f. Following relevant codes of practice, OHS and environmental protection procedures and requirements
  g. Completing relevant technical reports, records and documentation, and
  h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to maintaining electronic switched and microprocessor-based remote control systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State or Territory codes of practice and safe working requirements
- Equipment and systems relevant to the rail network for which competency is sought
- Code of practice for Defined Interstate Rail Networks
- System monitoring and performance analysis detecting and rectifying at least five different system faults

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Rail Signalling

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UEENEEN118A Find and repair rail signalling system faults

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers finding and repairing faults with rail signalling, systems. It encompasses safe working, regulatory requirements and following work procedures, predicting likely signalling system faults, using appropriate fault finding techniques, repairing or rectifying faults and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 114A	Install and maintain computer based interlocking systems

OR

UEENEEN 112A	Install and maintain vital relay interlocking systems

And

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to find and repair signalling system faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	Appropriate persons are consulted to establish the nature of the fault and to coordinate effectively with others affected by the fault.
	1.5	Likely causes of the fault and order of probability are determined from system data and historical trend.
	1.6	Impact of the fault on system is ascertained and appropriate personnel notified in accordance with established procedures.
	1.7	Materials needed to find and repair the fault are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to find and repair the fault are obtained in accordance with established procedures and

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ELEMENT		PERFORMANCE CRITERIA	
			checked for correct operation and safety.
		1.9	Circuits/equipment are checked as being isolated where necessary in strict accordance operational procedures and OHS requirements.
2	Find and repair signalling system faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of signalling system performance parameters is applied to appropriate fault finding techniques.
		2.3	Tests are conducted to determine the type and location of the fault.
		2.4	Wiring system is visually inspected for physical damage or installation defects where necessary.
		2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
		2.6	Ongoing checks of the signalling system are undertaken to confirm the continued rectification of the fault.
		2.7	Faults are located and identified efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
		2.8	Signalling system faults are rectified in accordance with established procedures
3	Complete the finding and repair of the signalling system faults	3.1	OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Unresolved faults are reported to appropriate persons for further action in accordance with established procedures.
		3.3	Inspection and test results actions taken or recommended are documented and appropriate person(s) notified in accordance with established

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ELEMENT	PERFORMANCE CRITERIA	
		procedures.
	3.4	Documentation including component faults, test results, authorisations and permits is completed to provide an accurate database and facilitate follow up action, and relevant reports produced.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and finding and repairing of rail signalling system.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN118A Rail signalling system fault finding and repair

Evidence shall show an understanding of rail signalling system fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Fault-finding and diagnostic techniques encompassing:

Establish an accurate description of the fault situation by appropriate questioning of client or operator

questioning techniques to efficiently and effectively obtain from a client/operator a description of a fault situation.

Confirm the fault history and symptoms through observation and application of first-line tests.

draw valid conclusions from observations.

identify concepts of broad first-line testing.

In the absence of the client or operator, to establish the symptoms through application of systematic tests and observation.

identify appropriate diagnostic tests for given symptoms using manufacturers' charts, handbooks, specification sheets.

use results of systematic tests to identify symptoms.

Rail signalling system fault finding encompassing:

System operational and safety requirements

Common mechanical faults, symptoms and testing

Common electrical faults, symptoms and testing

Common control faults, symptoms and testing

Rail signalling system repairs encompassing:

System operational and safety requirements

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REQUIRED SKILLS AND KNOWLEDGE

Fault/circuit/system isolation

Repairing/replacing faulty components

Component testing

Reconnection of component/circuit/system

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous

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substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Locate and repair 3 different types of rail signalling system faults, as described in 8) and including:

  a. Interpreting plans and specifications correctly
  b. Identifying and interpreting fault history
  c. Identifying faults efficiently
  d. Rectifying faults promptly using appropriate diagnostic techniques
  e. Minimising interruption to rail traffic and services
  f. Using testing equipment and tools correctly and safely
  g. Confirming the integrity of the signalling system
  h. Following relevant codes of practice
  i. Completing relevant technical reports, records, and
  j. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and

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replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to locating and repairing cable system faults.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN112A Install and maintain vital relay interlocking systems

UEENEEN114A Install and maintain computer based interlocking systems

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State or Territory codes of practice and safe working requirements
- Equipment and systems relevant to the rail network for which competency is sought
- Code of practice for Defined Interstate Rail Networks

Activities may include: procedures for fault finding and repair of rail signalling systems and equipment and may also include; the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Fault finding activities may include: finding and repairing faults on rail signalling systems and equipment and may also incorporate: safe working, working according to regulatory requirements and following work procedures, adjust, test and verifying operational integrity and completing report documentation.

Electrical equipment may include: power supplies, isolation links, fuses, electro-mechanical vital relays, computer based interlocking equipment, mechanical timer relays, electronic timer relays, wiring, train detection devices, signals and train protection devices, point actuating devices, level crossing protection devices, non-vital telemetry system devices and screen based non-vital control system devices.

Mechanical equipment may include: relay mounting bases, relay coding pins,

Test equipment may include: multimeters, insulation resistance and continuity tester, stop watches, test lamps, relay delatch bases.

Types of system faults may include: incorrect installation, power loss, open and short circuits, operator error, damaged equipment, vandalism and environmental factors.

Technical report may include: incident report, fault analysis and rectification report and data log report.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN121A Repair rail signalling power and control cables

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers repair of signalling power cables and multi core signalling control cables up to 50 cores. It encompasses safe working, regulatory requirements and following work procedures, selecting and using appropriate cable joining methods, testing continuity and insulation resistance of repaired cable cores and reporting repair activities.

Application of the Unit

Application of the Unit

2)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken within regard to the requirements of License

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to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems AQF Level 3 or higher

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the ‘Code Of Practice for the Defined Interstate Rail Network’ for work carried out on that network

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 102A	Assemble and wire internal electrical rail signalling equipment

And

Work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to repair rail signalling cables	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Access times and methods are confirmed to comply with customer requirements and relevant legislation.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	Extent and nature of the damage to the rail signalling cable is confirmed with appropriate personnel and through established procedures.
	1.7	Appropriate cable joining kit is obtained in accordance with established procedures and checked against manufacturer’s instructions to ensure all components are included.
	1.8	Cable diagrams necessary to effect repairs are obtained, read and understood.
	1.9	Tools and cable testing devices appropriate for the cable repair are obtained in accordance with established procedures and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Repair damaged rail signalling cables	2.1	Work area made safe, the damaged cable is isolated for repair and other OHS risk control measures and procedures for carrying out the repair are followed
	2.2	Corresponding ends of broken cable core are identified by core marking and confirmed by continuity test
	2.3	Appropriate cable joining kit is used to repair damaged cable following manufacturer's instructions and established procedures
	2.4	Effectiveness of the repair to the damage cable is tested for cable core continuity, insulation between cable cores and cores to earth.
	2.5	Cause of unacceptable test results is located and rectified in accordance with established procedures
	2.6	Established methods for dealing with unexpected situations are dealt with safely and with the approval of an authorised person
	2.7	Cable repair is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices
3 Complete rail signalling cable repairs	3.1	OHS work completion risk control measures and procedures are followed
	3.2	Work area is cleaned and made safe in accordance with established procedures
	3.3	Cable repair work is documented including test results and an appropriate person or persons notified in accordance with established procedures, and relevant reports produced

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and performing rail signalling cable repairs.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN121A Rail signalling power and control cables repair

Evidence shall show an understanding of repairing rail signalling cables to an extent indicated by the following aspects:

Types of cable used for rail signalling encompassing:

signalling power cables and multi core signalling control cables

Types of cable joining kits used to repair damaged signal cables encompassing:

heat shrink and water proof jointing kits. (e.g. epoxy mould)

Procedures for identifying corresponding ends of broken cable cores encompassing:

cable isolation methods and testing deenergised cable cores

Methods of joining broken cable core conductors and reinstating insulation encompassing:

use of hand tools to remove insulation and applying crimp lugs, selection of inline joiner lugs, and selection of appropriate jointing materials and kits

Conductor continuity and core insulation and earth testing procedures and acceptable results encompassing:

testing to confirm deenergised cores; continuity of repaired cores, earth resistance of repaired cores and insulation between repaired cores; industry standard acceptable cable test results; and recording of test results

Special termination tools and their use encompassing:

use of insulation removal tools inline crimping tools, conducting tool tests, checking calibration date and recording tests

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment

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Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Perform signalling cable repairs for the following:
    - Repairing at least one signalling power cable relevant to a particular rail network.
    - Repairing at least one signalling multi-core control cable, 6 cores or greater, relevant to a particular rail network
    - Repairing signalling cables using at least one approved

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jointing kit, and

- System tests as described in 8) and including:

a. Selecting approved cable joining kit, cable repair tools and testing devices
b. Interpreting cable diagrams
c. Identifying corresponding ends of broken cable cores accurately
d. Repairing damaged cable effectively
e. Using testing devices and tools correctly and safely
f. Locating and rectifying causes of unacceptable cable test results
g. Completing relevant technical reports, records and documentation, and
h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

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The resources used for assessment should reflect current industry practices in relation to performing signalling cable repair and system tests.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN118A Find and repair rail signalling

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to:

- the relevant State/Territory codes of practice and safe working requirements

Activities may include procedures for the isolation of signalling cable from supply and/or equipment, and may also include the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Jointing activities may include: crimping, soldering, heat shrinking and epoxy jointing.

Testing activities may include; continuity tests, insulation resistance tests, determining fit for signalling purpose, compliance and functional testing and completing the necessary documentation.

Codes/practices could include dial before you dig.

Plant could include; back hoe, Pot holing and generators

Test equipment may include; insulation resistance and continuity tester, multimeter, bell/buzz tester, voltage detector and or daisy chain.

Technical report may include: Safety incident report, cable survey report and defect report

Specialised equipment, tools and devices may include cable locator and cable fault tester.

Equipment relevant to a particular rail network.

Associated hardware could include Trunking, cable pits, conduits and terminals.

Cable types may include: copper, single core, double core and multi-core signalling cables.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEN126A Develop rail signalling system maintenance programs

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the development of programs for the maintenance of rail signalling equipment and infrastructure. It encompasses safe working, regulatory requirements, and work procedures including identifying tasks and work responsibilities and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under the codes of practice and regulations of the State/Territory for which the work is carried out. This includes codes of practice such as the ‘Code of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 106A	Install and maintain non-vital screen based rail control systems
UEENEEN 110A	Install and maintain non-vital telemetry systems
UEENEEN 118A	Find and repair rail signalling system faults

And

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop rail signalling maintenance programs	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	Safety hazards that have previously been identified are noted, and established risk control measures are implemented.
	1.4	Maintenance programming is appropriately sequenced in accordance with job schedule.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Location of equipment to be maintained is determined from job specifications and diagrams.
2 Develop rail signalling maintenance programs	2.1	Maintenance programs are developed to cover all work requirements with regard to relevant workplace conditions
	2.2	Programs are arranged to allow sufficient flexibility to allow contingency plans to be implemented

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ELEMENT	PERFORMANCE CRITERIA	
	2.3	Programs are circulated in accordance with workplace policies and procedures for review by affected personnel
	2.4	Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.
3 Finalise rail signalling maintenance program	3.1	Feedback from personnel associated with the maintenance program is addressed and acceptable modifications agreed.
	3.2	Final rosters are documented and distributed to ensure work requirements are accurately communicated.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing rail signalling maintenance programs.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN126A Rail signalling maintenance program development

Evidence shall show an understanding of rail signalling maintenance program development, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Maintenance principles encompassing:

maintenance function

role of maintenance department

occupational health and safety requirements

Maintenance systems encompassing:

maintenance terminology

preventative maintenance

predictive maintenance

corrective maintenance

Data acquisition encompassing:

plant history cards/files

inspection techniques

predictive maintenance

remote visual inspection

non-destructive testing

thermography

vibration analysis

oil analysis

Rail signalling maintenance plan development encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

characteristics of rail signalling operation

assessment of failure characteristics

link failure characteristics to maintenance systems

identify of maintenance windows

resources

labour

materials

establish plan

implementation procedures and records

plan review

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

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various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge

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and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop rail signalling maintenance programs as described in 8) and including:

  a. Interpreting specifications correctly
  b. Checking that technical/operational specifications are met and that equipment is in compliance with work orders
  c. Ensuring safe train movement through work area
  d. Following relevant codes of practice, OHS and environmental protection procedures and requirements
  e. Completing relevant technical reports, records and documentation, and
  f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing rail signalling maintenance programs.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State or Territory codes of practice and safe working requirements
- Equipment relevant to a particular rail network
- Code of practice for Defined Interstate Rail Networks

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Rail Signalling

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UEENEEN127A Decommission electrical and electro-mechanical rail signalling from service

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the de-commissioning of electrical and electro-mechanical signalling systems from service on rail networks. It encompasses safe working, regulatory requirement work procedures, disconnection of operating and redundant circuitry, equipment and components, testing of remaining circuitry and equipment, finding and repairing faults, testing of control and indicating equipment and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under the codes of practice and regulations of the State/Territory for which the work is carried out. This includes codes of practice such as the ‘Code of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 106A	Install and maintain non-vital screen based rail control systems
UEENEEN 110A	Install and maintain non-vital telemetry systems
UEENEEN 118A	Find and repair rail signalling system faults

And

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the

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Employability Skills	**5)** qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to decommission electrical and electro-mechanical rail signalling from service	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of decommissioning is determined from, job specifications, design drawings and regulatory requirements.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.5	Materials needed for the safe disconnection of circuits, equipment and components are obtained in accordance with established procedures and checked against job requirements.
	1.6	Tools, equipment and testing devices needed to disconnect circuits; equipment and components are obtained in accordance with established procedures and checked for correct operation

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ELEMENT	PERFORMANCE CRITERIA	
		and safety.
2 Decommission electrical and electro-mechanical rail signalling from service	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Where applicable on-track safety requirements are complied with to enterprise standards
	2.3	Visual inspection is carried out and all circuits, equipment and components are checked to ensure they are in accordance with manufacturer and systems specifications.
	2.4	Disconnecting work includes the isolation and removal of redundant wiring and the termination of altered wiring, checking and adjusting levels, checking indicators and system operation is carried out to organisation requirements.
	2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.6	Decommissioning is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.7	System and design faults are verified using appropriate technical information, fault finding and diagnostic techniques to identify faulty signalling equipment.
	2.8	Faulty signalling equipment is replaced, adjusted and secured in accordance with manufacturer specifications and organisation procedures.
	2.9	Control equipment is adjusted and tested using appropriate test procedures and equipment to ensure it operates within the specified technical parameters.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete decommissioning work and reports	3.1	OHS work completion risk control measures and procedures are followed.
		System faults are identified and reported for follow-up action.
		Test results are documented in accordance with organisation requirements and faulty or replaced equipment is tagged and dispatched to maintain equipment spares.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and decommissioning electrical and electro-mechanical signalling from service.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN127A Electrical and electromechanical rail signalling decommissioning

Evidence shall show an understanding of electrical and electromechanical rail signalling decommissioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Purpose of decommissioning

Decommissioning planning and documentation

Decommissioning requirements and hazards

Decommissioning procedures

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Decommission electrical and electro-mechanical signalling from service as described in 8) and including:

  a. Reading and interpreting specifications correctly

  b. Disconnecting signalling circuits, equipment and components to meet operational and technical standards

  c. Using effective fault diagnosis and repair/replacement techniques to specified model level

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d. Confirming circuits, equipment and components operated within specified technical parameters
e. Testing equipment and instruments
f. Using tools correctly
g. Following relevant codes of practice, environmental protection procedures and requirements
h. Completing relevant technical reports, records and documentation, and
i. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to decommissioning electrical and electro-mechanical signalling from service.

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Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State or Territory codes of practice and safe working requirements
- Equipment relevant to a particular rail network
- Code of practice for Defined Interstate Rail Networks

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field 11)

Rail Signalling

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UEENEEN128A Test and commission rail power equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the testing and commissioning of rail signalling power equipment into service on rail networks. It encompasses safe working, regulatory requirement work procedures, connection of wiring circuitry, equipment and components, testing of wiring circuitry, equipment and components, finding and repairing faults, testing of control and indicating equipment and reporting.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may only be practised in the workplace under the codes of practice and regulations of the State/Territory for which the work is carried out. This includes codes of practice such as the ‘Code of Practice for the Defined Interstate Rail Network’ for work carried out on that network.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 106A	Install and maintain non-vital screen based rail control systems
UEENEEN 110A	Install and maintain non-vital telemetry systems
UEENEEN 118A	Find and repair rail signalling system faults

And

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to test and commission power signalling circuits, equipment and components	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3	The extent of testing and commissioning is determined from job specifications, design drawings and regulatory requirements.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.5	Materials needed for the testing and commissioning of power signalling circuits, equipment and components are obtained in accordance with established procedures and checked against job requirements.
	1.6	Tools, equipment and testing devices needed to test and commission power signalling circuits, equipment and components are obtained in accordance with established procedures and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Test and commission power signalling circuits, equipment and components	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Where applicable on-track safety requirements are complied with to enterprise standards
	2.3	Visual inspection is carried out and all circuits, equipment and components are checked to ensure they are in accordance with manufacturers and systems specifications.
	2.4	Testing and commissioning work includes the installation, termination and operation of the equipment, checking and adjusting levels and checking indicators and system operation is carried out to organisation requirements.
	2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.6	Testing, commissioning and repairs are performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	2.7	System and design faults are verified using appropriate technical information, fault finding and diagnostic techniques to identify faulty wiring, equipment and components
	2.8	Identified irregularities and non-conforming wiring, equipment or components are documented and immediate follow up action is initiated to ensure all faults are rectified
	2.9	Faulty signalling equipment is replaced, adjusted and secured in accordance with manufacturer specifications and organisation procedures.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete testing and commissioning work and reports	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Test results are documented in accordance with organisation requirements and faulty or replaced equipment is tagged and dispatched to maintain equipment spares.
	3.3	Fully operational equipment is handed over to approved personnel ensuring that hand over procedures are accurately followed and final documentation is completed

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and testing and commissioning power signalling equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EN128A Power signalling testing and commissioning

Evidence shall show an understanding of power signalling testing and commissioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Power signalling system design encompassing:

Characteristics

Diagrams

Specifications

Power signalling components encompassing:

Types

Testing

Adjustments

Power signalling system commissioning encompassing:

Requirements

Hazards

Procedures

Records and reporting

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Test and commission power signalling equipment as described in 8) and including:

    a. Reading and interpreting specifications correctly

    b. Testing and commissioning signalling circuits, equipment and components to meet operational and technical standards

    c. Using effective fault diagnosis and repair/replacement

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techniques to specified model level

d. Confirming circuits, equipment and components operated within specified technical parameters
e. Testing equipment and instruments
f. Using tools correctly
g. Following relevant codes of practice, environmental protection procedures and requirements
h. Completing relevant technical reports, records and documentation, and
i. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to testing and commissioning power signalling equipment.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to:

- The relevant State or Territory codes of practice and safe working requirements
- Equipment relevant to a particular rail network
- Code of practice for Defined Interstate Rail Networks

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Rail Signalling

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UEENEEP010A Disconnect - reconnect appliances connected to low voltage installation wiring

Modification History

Release	Action	Core/Elective	Details	Points
3	Edit		Amend Required Skills and Knowledge to include KS01 – Electrical Safety.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers disconnecting and reconnecting appliances connected to low voltage installation wiring. This may be incidental to or a primary and regular function of work related to a principle work function. It encompasses working safely, identifying supply arrangements, following isolation procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safely testing and reporting.

The unit coverage excludes disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).

Application of the Unit

Application of the Unit

2)

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit requires a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Competencies needed for emergency services and equipment repair.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

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Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to disconnect electrical appliance	1.1	Disconnection is planned to ensure OHS policies and procedures are followed.
	1.2	Appropriate persons are consulted to ensure work is coordinated effectively with others involved in the work site.
	1.3	Safety hazards which have not previously been electrical characteristics of electrical appliance and electrical supply are determined and recorded in accordance with established procedures.
	1.4	The point of isolation of electrical appliance to be disconnected is determined.

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Disconnect electrical appliance	2.1	OHS policies and procedures are followed.
		2.2	Electrical appliance is isolated in accordance with AS/NZS 4836 and established procedures (see Range Statement).
		2.3	Conductor connection sequence is recorded and labelled in accordance with established procedures.
		2.4	Visual checks of the electrical appliances and associated wiring are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
		2.5	Isolated equipment is confirmed as de-energised.
		2.6	Electrical appliance is disconnected from fixed wiring without damage to other components.
		2.7	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
		2.8	Disconnected conductors/cables are terminated in accordance with requirements to ensure they are safe and present no potential hazard.
3	Prepare to reconnect electrical appliance	3.1	Reconnection is planned to ensure OHS policies and procedures are followed.
		3.2	Appropriate personnel are consulted to ensure work is coordinated effectively with others involved in the work site.
		3.3	The point of isolation of the circuit to which the electrical appliance is to be connected is determined.
		3.4	Replacement electrical appliance is selected on

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ELEMENT	PERFORMANCE CRITERIA	
		the basis of rating and characteristics being the same as that of the original electrical appliance.
	3.5	Appropriate personnel are consulted in the event that replacement electrical appliance is not available.
	3.6	Original and/or replacement electrical appliance is tested to ensure it is safe to connect to the electrical supply and use.
	3.7	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
4 Reconnect electrical appliance.	4.1	OHS policies and procedures are followed.
	4.2	Measures are taken to ensure circuit to which electrical appliance is to be connected remains isolated and de-energised in accordance with AS/NZS 4836.
	4.3	The continuity of the protective earthing conductor is tested to determine whether it is sufficiently low.
	4.4	The resistance between the protective earthing conductor and the neutral conductor is tested to determine whether it is sufficiently low, i.e. not greater than 2 Ohms.
	4.5	The insulation resistance of active conductors is tested to confirm that it is greater than 1 Megohm.
	4.6	An appropriate qualified person is engaged to rectify any non-compliance condition revealed by the testing under item 4.3 to 4.5.
	4.7	Continuity between exposed conductive parts of the appliance and the main earth or metal switchboard enclosure is confirmed.
	4.8	Electrical appliance is connected to comply with requirements.

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ELEMENT		PERFORMANCE CRITERIA	
		4.9	Connections to the appliance are checked to confirm they are correct.
5	Test the reconnected electrical appliance for safe operation.	5.1	OHS policies and procedures, and established procedures for the reinstatement of isolated circuits and electrical appliance are followed.
		5.2	Arrangements are made with appropriate personnel to test the operation of the electrical appliance in accordance with established procedures.
		5.3	Operational non-conformances are identified and reported in accordance with established procedures.
6	Identify and report faults	6.1	Electrical appliance is isolated in accordance with established procedures.
		6.2	Other OHS policies and procedures are followed.
		6.3	Visual checks of the appliance to be disconnected and/or reconnected are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
		6.4	Fault(s) at point of disconnection and/or reconnection are identified and reported in accordance with established procedures.
		6.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
7	Provide status report(s)	7.1	Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and disconnecting and reconnecting fixed wired electrical appliance connected to a Low Voltage supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP010A Electrical Safety Principles

Evidence shall show an understanding of electrical safety principles to an extent indicated by the following aspects

T1 The basic electrical circuit encompassing:

- elements of a simple electric circuit (supply, control switch, protection device and load).
- definition, the symbol and the abbreviation of the unit for electromotive force, potential difference, current, resistance
- types of electrical load
- need for devices to afford electrical protection and the mechanisms used in protection devices including resetting
- symbols for the components of a basic electrical circuit
- connection of the circuit from the schematic diagram
- a.c supply (both single and three phase) and d.c. supply
- correct connection and use of voltmeters and ammeters, including the selection of correct range in terms of magnitude and whether the supply is a.c. or d.c.
- need for isolating, testing and tagging electrical circuits
- isolation, testing and tagging accessories in a simulated environment
- connecting a simple electrical circuit including supply, control switch and load.
- measuring voltage and current within a simple circuit

T2 Relationships in an electrical circuit encompassing:

- relationship between Voltage, Current and Resistance
- connection of meters to determine resistance from voltmeter and ammeter readings using a variation of the Ohm’s Law relationship
- predicting changes in circuit parameters for altered values of voltage, current and resistance
- definition of ‘power’ in electrical terms (for d.c. or resistive a.c. circuits)

using circuit readings determine power using the appropriate equations, symbols and unit abbreviations including the use of multiples and sub multiples

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REQUIRED SKILLS AND KNOWLEDGE

T3 Electrical diagrams encompassing:

- symbols used for fuse, circuit breaker, isolator, normally open contacts, normally closed contacts, coil, energy meter, a.c. motor, transformer.
- using a ‘block diagram’ as means of developing concepts and understanding
- producing a block diagram of a simple circuit
- function of single line diagrams including their application in three phase systems
- definition of a ‘circuit’ or ‘schematic’ diagrams
- wiring diagrams
- connecting a simple circuit using a schematic diagram noting the wide degree of variety in the way the conductors may be run
- producing the wiring diagram of the connections used in following the schematic diagram
- connecting a simple circuit following a wiring diagram
- producing a schematic diagram from the wiring diagram

T4 Test equipment – selection and care encompassing:

- fault currents and the implications of incorrectly connecting a meter to a high fault current source
- category ratings of multimeters in terms of their breaking capacity (fault current interruption) and identification of the appropriate category of instrument for typical domestic work and for typical commercial work.
- regulatory requirements in regard to the maintenance and testing of test instrumentation.
- steps and procedures for the safe use, care and storage of electrical instruments.
- selecting test equipment for given situations.

T5 Test equipment - Voltage measurement encompassing:

- voltage measurement -meters connected in parallel
- operation of series test lamps
- construction of a set of series test lamps with emphasis on safety requirements
- using a set of series test lamps
- operation of neon test pencils and test screwdrivers with emphasis on the limitations of their safe use
- operation and limitations of voltage probes including their limitations
- using an analog multimeter for voltage measurement ensuring the following - setting zero, correct scale; ac or dc, polarity and magnitude, avoiding parallax error and estimating between division readings
- using a digital multimeter for voltage measurement ensuring the following - correct range and no active conductors are connected to any meter earth

T6 Test equipment - Resistance measurement encompassing:

- voltmeter-ammeter method of resistance measurement

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REQUIRED SKILLS AND KNOWLEDGE

- measuring resistance in a simple circuit using the voltmeter-ammeter method with emphasis on the correct choice of long or short shunt
- measuring resistance in a simple circuit using an analog multimeter ensuring the following - setting zero, selecting correct range, estimating of between division readings
- measureing resistance using a digital multimeter
- insulation resistance, and list the required minimum values for insulation resistance for low voltage wiring and low voltage equipment (insulation resistance between active and earth the value for appliances incorporating heating elements)
- insulation resistance needs to be measured at higher than supply voltage and list the voltages to be used
- conducting insulation resistance tests using a hand held tester after checking for zero and meter calibration
- continuity and what a continuity tester does
- checking the polarity of a three core extension cord using a continuity tester

T7 Test equipment - Current measurement encompassing:

- advantage(s) of the clip-on method of current measurement
- measuring current in a simple circuit using a multimeter on the correct current range and explain why a series connection must be used
- measuring current using a clip-on (tong tester) taking each circuit conductor in turn.

KS02-EP010A Disconnect and Reconnect Electrical Appliances

Evidence shall show an understanding of disconnect and reconnect electrical appliances to an extent indicated by the following aspects

T1 Cable connections encompassing:

construction of typical power cables.

principle of operation of the following types of terminals stud, screw, tunnel, faston and soldered

cable preparation and terminating methods appropriate to each type of terminal, including any special requirements which apply

terminating cables using all of the above terminal types employing the correct preparation and the relevant terminating tools including the correct size soldering equipment

T2 Protection for Safety encompassing:

dangers associated with earth-faults.

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REQUIRED SKILLS AND KNOWLEDGE

protection of persons against electric shock from earth-faults.

maintaining a low earth-fault current path resistance.

components in an earth-fault current path.

testing the resistance of a fault-current path.

regulatory issues/requirements/limitations in regards to working live

T3 Safety testing preparation and procedures encompassing:

faulty earth-fault current paths

using safe working practices when carrying out fault finding work.

Identification of earthing system components.

unsatisfactory resistance of a fault-current path.

actions to rectify unsatisfactory resistance of an earth-fault current path or insulation.

T4 Isolating supplies encompassing:

regulatory requirements in regards to working de-energised, and ensuring and maintaining isolation

reasons for advising all personnel likely to be affected:

preventing others wanting to remake supply

reason for isolation and approximate time of outage to allow planning of alternate activities

identification the type and arrangement of circuits supplying equipment that is to be disconnected

availability of supply is tested at an appliance about to be disconnected

locating isolation device/s e.g. lockable adjacent isolating switch or fuse/circuit breaker at a distribution board usually identified at the appliance

determining the method of isolation to be used; which available device

isolating a supply at a fuse, the fuse wedge is removed only after the appliance is turned off and why the empty wedge is replaced once the fusible link has been removed

tests to determine if an appliance/equipment is turned off when isolating at a fuse/circuit breaker

use of and reason for danger tags at the point of isolation

reason for the following steps: testing on a known live supply, testing for isolation, retesting on a known live supply after confirming isolation

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REQUIRED SKILLS AND KNOWLEDGE

T5 Disconnecting an electrical appliances - ELV encompassing:

identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a ELV single phase and/or multiphase supply of voltages up to 50 V a.c. or 120 V d.c.

procedures that ensure the safe isolation of the supply to electrical appliances which is to be disconnected.

disconnecting isolated electrical appliances from fixed wiring with minimal damage to wiring system. after ensuring no visible faults or damage, and the recording of conductor connection sequence

termination practices in regard to disconnected wiring

T6 Reconnecting an electrical appliances - ELV encompassing:

importance of checking the new electrical appliances nameplate details against those of the appliance being replaced

need for high insulation resistance and the need to test insulation of 400 volt electrical appliances at 1000 volts and identify the minimum acceptable value of insulation resistance between active and earth generally and the value for appliances incorporating heating elements.

testing procedures: testing on a known live supply, testing for isolation and retesting on a known live supply after confirming isolation

need to disconnect circuit cables before undertaking insulation resistance testing

compliance testing the fixed electrical appliances: insulation resistance test and continuity test

need to ensure the following steps are taken when terminating cables: stranded conductors are twisted tightly together, appropriate lugs are used rather than simple loops under a nut e.g. soldered lugs or Ross Courtney, Stanco or other solderless variety, shake proof washers are used, cables are not left under physical stress, cables are protected when passing through metal openings, conductors are doubled in tunnel connectors

T7 Disconnecting an electrical appliances - LV encompassing:

identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.

procedures that ensure the safe isolation of the supply to equipment which is to be disconnected

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REQUIRED SKILLS AND KNOWLEDGE

disconnection of isolated equipment from fixed wiring with minimal damage to wiring system after ensuring no visible faults or damage, and the recording of conductor connection sequence

termination practices in regard to disconnected wiring

T8 Reconnecting an electrical appliances – LV encompassing:

importance of checking the new electrical appliances nameplate details against those of the electrical appliances being replaced

need to visually inspect and test the appliances electrical characteristics using suitable test equipment to ensure equipment is safe to connect in regard to sufficiently high insulation resistance, arrangements for protection against indirect contact are undamaged and in place, appropriate IP rating, and arrangements for protection against dangers of mechanical movement are undamaged and in place

compliance testing of the fixed electrical appliances, ie insulation resistance and continuity

testing the disconnected electrical appliances for faults (open circuits, partial open circuits, short circuits, partial short circuits and earth faults), and recognise any unsatisfactory test results obtained

procedures for equipment with unsatisfactory results - unsuitability for reconnection

identification of the type and arrangement of circuits supplying equipment that is to be reconnected to a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.

procedures ensuring isolation of supply

process to establish the integrity of the circuit to which the disconnected equipment is to be connected, including:

testing the resistance between the protective earthing conductor and neutral conductor as applicable is sufficiently low ie not greater than 2 ohms

insulation resistance of the active conductors is greater than 1 megohm

engaging appropriately qualified person to rectify any noncompliance

appropriate cable termination practices

reconnection of electrical appliances to fixed wiring with minimal damage to wiring system

continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure

restoring supply after ensuring correct connections, and all safety requirements have been met

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REQUIRED SKILLS AND KNOWLEDGE

testing the supply at electrical appliances

restoring all mechanical protection eg terminal covers

checking operation of reconnected equipment

T9 Produce documentation and reports encompassing:

need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads.

production of reports and documents to use a suitable procedure to safely disconnect a component from a single phase supply and/or multiphase supply.

content required in reports and documents used to safely determine the suitability of a component for reconnection to supply.

producing reports and documents for the safe reconnection/commissioning of a component to the supply.

T10 Enterprise reporting and recording system encompassing:

purpose and extent of maintaining work activities records in an enterprise

types of records for maintaining work activities in an enterprise

methods for recording and maintaining work records

work records for regulation requirements

producing enterprise records and documents for the safe reconnection/commissioning of a component to the supply.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Disconnect and reconnect fixed wired electrical appliance connected to a Low Voltage supply as described in 8) for each endorsement and including:

    a. OHS practice

    b. Determining electrical characteristics of appliance

    c. Selecting tools, equipment, and testing devices

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d. Identifying point of installation
e. Identifying and isolating circuit (including testing for safe isolation)
f. Preparing to disconnect electrical appliance
g. Undertaking visual checks of the electrical appliance and associated wiring to detect and reporting any abnormal or obvious damage or fault
h. Disconnecting of electrical appliance
i. Preparing to reconnect electrical appliance
j. Reconnection of electrical appliance
k. Testing of the reconnected electrical appliance for safe operation including polarity and earth continuity
l. Identifying fault(s) at point of disconnection and/or reconnection in accordance with established procedures
m. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

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Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to disconnecting and reconnecting fixed wired electrical appliance connected to a Low Voltage supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to disconnecting and reconnecting electrical appliance connected to supplies up to 1,000 V a.c or 1,500 V d.c:

Note:

Limitations of this unit. This unit does not cover installations

a. where high fault currents are possible,
b. comprised of complex electrical apparatus and circuits,
c. associated with fixed wiring including locating and rectifying faults of circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work),
d. which are luminaries,
e. in hazardous areas or on electrical equipment that is part of an explosion-protection technique.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836 ‘Safe working on low-voltage electrical installations.’

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP011A Disconnect - reconnect neon signs connected to low voltage installation wiring

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers disconnecting and reconnecting neon signs connected to low voltage installation wiring. This may be incidental to or a primary and regular function of work related to a principle work function. It encompasses working safely, identifying supply arrangements, following isolation procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safely testing and reporting.

The unit coverage excludes disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).

Application of the Unit

Application of the Unit **2)**

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit requires a

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License to practice **3)**

license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Competencies needed for emergency services and equipment repair.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to disconnect neon signs	1.1	Disconnection is planned to ensure OHS policies and procedures are followed.
	1.2	Appropriate persons are consulted to ensure work is coordinated effectively with others involved in the work site.
	1.3	Safety hazards which have not previously been electrical characteristics of neon signs and electrical supply are determined and recorded in accordance with established procedures.
	1.4	The point of isolation of neon signs to be disconnected is determined.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for

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ELEMENT	PERFORMANCE CRITERIA	
		correct operation and safety.
2 Disconnect neon sign	2.1	OHS policies and procedures are followed.
	2.2	Neon sign is isolated in accordance with AS/NZS 4836 and established procedures (see Range Statement).
	2.3	Conductor connection sequence is recorded and labelled in accordance with established procedures.
	2.4	Visual checks of the neon signs and associated wiring are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	2.5	Isolated equipment is confirmed as de-energised.
	2.6	Neon sign is disconnected from fixed wiring without damage to other components.
	2.7	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	2.8	Disconnected conductors/cables are terminated in accordance with requirements to ensure they are safe and present no potential hazard.
3 Prepare to reconnect neon sign	3.1	Reconnection is planned to ensure OHS policies and procedures are followed.
	3.2	Appropriate personnel are consulted to ensure work is coordinated effectively with others involved in the work site.
	3.3	The point of isolation of the circuit to which the neon sign is to be connected is determined.
	3.4	Replacement neon sign is selected on the basis of rating and characteristics being the same as that of the original neon sign.
	3.5	Appropriate personnel are consulted in the event that replacement neon sign is not available.

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ELEMENT	PERFORMANCE CRITERIA	
	3.6	Original and/or replacement neon sign is tested to ensure it is safe to connect to the electrical supply and use.
	3.7	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
4 Reconnect neon sign	4.1	OHS policies and procedures are followed.
	4.2	Measures are taken to ensure circuit to which neon sign is to be connected remains isolated and de-energised in accordance with AS/NZS 4836.
	4.3	The continuity of the protective earthing conductor is tested to determine whether it is sufficiently low.
	4.4	The resistance between the protective earthing conductor and the neutral conductor is tested to determine whether it is sufficiently low, i.e. not greater than 2 Ohms.
	4.5	The insulation resistance of active conductors is tested to confirm that it is greater than 1 Megohm.
	4.6	An appropriate qualified person is engaged to rectify any non-compliance condition revealed by the testing under item 4.3 to 4.5.
	4.7	Continuity between exposed conductive parts of the appliance and the main earth or metal switchboard enclosure is confirmed.
	4.8	Neon sign is connected to comply with requirements.
	4.9	Connections to the appliance are checked to confirm they are correct.

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ELEMENT	PERFORMANCE CRITERIA	
5 Test the reconnected neon sign for safe operation	5.1	OHS policies and procedures, and established procedures for the reinstatement of isolated circuits and neon sign are followed.
	5.2	Arrangements are made with appropriate personnel to test the operation of the neon sign in accordance with established procedures.
	5.3	Operational non-conformances are identified and reported in accordance with established procedures.
6 Identify and report faults	6.1	Neon sign is isolated in accordance with established procedures.
	6.2	Other OHS policies and procedures are followed.
	6.3	Visual checks of the appliance to be disconnected and/or reconnected are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	6.4	Fault(s) at point of disconnection and/or reconnection are identified and reported in accordance with established procedures.
	6.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
7 Provide status report(s)	7.1	Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and disconnecting and reconnecting fixed wired neon sign connected to a Low Voltage supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP011A Electrical Safety Principles

Evidence shall show an understanding of electrical safety principles to an extent indicated by the following aspects

T1 The basic electrical circuit encompassing:

- elements of a simple electric circuit (supply, control switch, protection device and load).
- definition, the symbol and the abbreviation of the unit for electromotive force, potential difference, current, resistance
- types of electrical load
- need for devices to afford electrical protection and the mechanisms used in protection devices including resetting
- symbols for the components of a basic electrical circuit
- connection of the circuit from the schematic diagram
- a.c supply (both single and three phase) and d.c. supply
- correct connection and use of voltmeters and ammeters, including the selection of correct range in terms of magnitude and whether the supply is a.c. or d.c.
- need for isolating, testing and tagging electrical circuits
- isolation, testing and tagging accessories in a simulated environment
- connecting a simple electrical circuit including supply, control switch and load.
- measuring voltage and current within a simple circuit

T2 Relationships in an electrical circuit encompassing:

- relationship between Voltage, Current and Resistance
- connection of meters to determine resistance from voltmeter and ammeter readings using a variation of the Ohm’s Law relationship
- predicting changes in circuit parameters for altered values of voltage, current and resistance
- definition of ‘power’ in electrical terms (for d.c. or resistive a.c. circuits)
- using circuit readings determine power using the appropriate equations, symbols and unit abbreviations including the use of multiples and sub multiples

T3 Electrical diagrams encompassing:

- symbols used for fuse, circuit breaker, isolator, normally open contacts, normally

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REQUIRED SKILLS AND KNOWLEDGE

closed contacts, coil, energy meter, a.c. motor, transformer.

- using a ‘block diagram’ as means of developing concepts and understanding
- producing a block diagram of a simple circuit
- function of single line diagrams including their application in three phase systems
- definition of a ‘circuit’ or ‘schematic’ diagrams
- wiring diagrams
- connecting a simple circuit using a schematic diagram noting the wide degree of variety in the way the conductors may be run
- producing the wiring diagram of the connections used in following the schematic diagram
- connecting a simple circuit following a wiring diagram
- producing a schematic diagram from the wiring diagram

T4 Test equipment – selection and care encompassing:

- fault currents and the implications of incorrectly connecting a meter to a high fault current source
- category ratings of multimeters in terms of their breaking capacity (fault current interruption) and identification of the appropriate category of instrument for typical domestic work and for typical commercial work.
- regulatory requirements in regard to the maintenance and testing of test instrumentation.
- steps and procedures for the safe use, care and storage of electrical instruments.
- selecting test equipment for given situations.

T5 Test equipment - Voltage measurement encompassing:

- voltage measurement -meters connected in parallel
- operation of series test lamps
- construction of a set of series test lamps with emphasis on safety requirements
- using a set of series test lamps
- operation of neon test pencils and test screwdrivers with emphasis on the limitations of their safe use
- operation and limitations of voltage probes including their limitations
- using an analog multimeter for voltage measurement ensuring the following - setting zero, correct scale; ac or dc, polarity and magnitude, avoiding parallax error and estimating between division readings
- using a digital multimeter for voltage measurement ensuring the following - correct range and no active conductors are connected to any meter earth

T6 Test equipment - Resistance measurement encompassing:

- voltmeter-ammeter method of resistance measurement
- measuring resistance in a simple circuit using the voltmeter-ammeter method with emphasis on the correct choice of long or short shunt
- measuring resistance in a simple circuit using an analog multimeter ensuring the following - setting zero, selecting correct range, estimating of between division

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REQUIRED SKILLS AND KNOWLEDGE

readings

- measureing resistance using a digital multimeter
- insulation resistance, and list the required minimum values for insulation resistance for low voltage wiring and low voltage equipment (insulation resistance between active and earth the value for appliances incorporating heating elements)
- insulation resistance needs to be measured at higher than supply voltage and list the voltages to be used
- conducting insulation resistance tests using a hand held tester after checking for zero and meter calibration
- continuity and what a continuity tester does
- checking the polarity of a three core extension cord using a continuity tester

T7 Test equipment - Current measurement encompassing:

- advantage(s) of the clip-on method of current measurement
- measuring current in a simple circuit using a multimeter on the correct current range and explain why a series connection must be used
- measuring current using a clip-on (tong tester) taking each circuit conductor in turn.

KS02-EP011A Disconnect and Reconnect Neon Signs

Evidence shall show an understanding of disconnect and reconnect neon signs to an extent indicated by the following aspects

T1 Cable connections encompassing:

- construction of typical power cables.
- principle of operation of the following types of terminals stud, screw, tunnel, faston and soldered
- cable preparation and terminating methods appropriate to each type of terminal, including any special requirements which apply
- terminating cables using all of the above terminal types employing the correct preparation and the relevant terminating tools including the correct size soldering equipment

T2 Protection for Safety encompassing:

- dangers associated with earth-faults.
- protection of persons against electric shock from earth-faults.
- maintaining a low earth-fault current path resistance.
- components in an earth-fault current path.
- testing the resistance of a fault-current path.
- regulatory issues/requirements/limitations in regards to working live

T3 Safety testing preparation and procedures encompassing:

- faulty earth-fault current paths
- using safe working practices when carrying out fault finding work.

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REQUIRED SKILLS AND KNOWLEDGE

- Identification of earthing system components.
- unsatisfactory resistance of a fault-current path.
- actions to rectify unsatisfactory resistance of an earth-fault current path or insulation.

T4 Isolating supplies encompassing:

- regulatory requirements in regards to working de-energised, and ensuring and maintaining isolation
- reasons for advising all personnel likely to be affected:
- preventing others wanting to remake supply
- reason for isolation and approximate time of outage to allow planning of alternate activities
- identification the type and arrangement of circuits supplying equipment that is to be disconnected
- availability of supply is tested at an neon sign about to be disconnected
- locating isolation device/s e.g. lockable adjacent isolating switch or fuse/circuit breaker at a distribution board usually identified at the neon sign
- determining the method of isolation to be used; which available device
- isolating a supply at a fuse, the fuse wedge is removed only after the neon sign is turned off and why the empty wedge is replaced once the fusible link has been removed
- tests to determine if an neon sign is turned off when isolating at a fuse/circuit breaker
- use of and reason for danger tags at the point of isolation
- reason for the following steps: testing on a known live supply, testing for isolation, retesting on a known live supply after confirming isolation

T5 Disconnecting an neon sign - ELV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a ELV single phase and/or multiphase supply of voltages up to 50 V a.c. or 120 V d.c.
- procedures that ensure the safe isolation of the supply to neon sign which is to be disconnected.
- disconnecting isolated electrical neon signs from fixed wiring with minimal damage to wiring system. after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T6 Reconnecting an neon sign - ELV encompassing:

- importance of checking the new electrical neon signs nameplate details against those of the neon sign being replaced
- need for high insulation resistance and the need to test insulation of 400 volt neon signs at 1000 volts and identify the minimum acceptable value of insulation resistance between active.

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REQUIRED SKILLS AND KNOWLEDGE

- testing procedures: testing on a known live supply, testing for isolation and retesting on a known live supply after confirming isolation
- need to disconnect circuit cables before undertaking insulation resistance testing
- compliance testing the neon sign: insulation resistance test and continuity test
- need to ensure the following steps are taken when terminating cables: stranded conductors are twisted tightly together, appropriate lugs are used rather than simple loops under a nut e.g. soldered lugs or Ross Courtney, Stanco or other solderless variety, shake proof washers are used, cables are not left under physical stress, cables are protected when passing through metal openings, conductors are doubled in tunnel connectors

T7 Disconnecting an neon sign - LV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures that ensure the safe isolation of the supply to equipment which is to be disconnected
- disconnection of isolated equipment from fixed wiring with minimal damage to wiring system after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T8 Reconnecting an neon sign – LV encompassing:

- importance of checking the new neon sign nameplate details against those of the electrical neon sign being replaced
- need to visually inspect and test the neon sign electrical characteristics using suitable test equipment to ensure equipment is safe to connect in regard to sufficiently high insulation resistance, arrangements for protection against indirect contact are undamaged and in place, appropriate IP rating, and arrangements for protection against dangers of mechanical movement are undamaged and in place
- compliance testing of the fixed neon sign, ie insulation resistance and continuity
- testing the disconnected neon sign for faults (open circuits, partial open circuits, short circuits, partial short circuits and earth faults), and recognise any unsatisfactory test results obtained
- procedures for equipment with unsatisfactory results - unsuitability for reconnection
- identification of the type and arrangement of circuits supplying equipment that is to be reconnected to a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures ensuring isolation of supply
- process to establish the integrity of the circuit to which the disconnected equipment is to be connected, including:
- testing the resistance between the protective earthing conductor and neutral conductor as applicable is sufficiently low ie not greater than 2 ohms

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REQUIRED SKILLS AND KNOWLEDGE

- insulation resistance of the active conductors is greater than 1 megohm
- engaging appropriately qualified person to rectify any noncompliance
- appropriate cable termination practices
- reconnection of neon sign to fixed wiring with minimal damage to wiring system
- continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure
- restoring supply after ensuring correct connections, and all safety requirements have been met
- testing the supply at neon sign
- restoring all mechanical protection eg terminal covers
- checking operation of reconnected equipment

T9 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads.
- production of reports and documents to use a suitable procedure to safely disconnect a component from a single phase supply and/or multiphase supply.
- content required in reports and documents used to safely determine the suitability of a component for reconnection to supply.
- producing reports and documents for the safe reconnection/commissioning of a component to the supply.

T10 Enterprise reporting and recording system encompassing:

- purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records for regulation requirements
- producing enterprise records and documents for the safe reconnection/commissioning of a component to the supply.

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The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

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- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Disconnect and reconnect fixed wired neon signs connected to a Low Voltage supply as described in 8) for each endorsement and including:

    a. OHS practice

    b. Determining electrical characteristics of neon signs

    c. Selecting tools, equipment, and testing devices

    d. Identifying point of installation

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e. Identifying and isolating circuit (including testing for safe isolation)
f. Preparing to disconnect neon sign
g. Undertaking visual checks of the neon sign and associated wiring to detect and reporting any abnormal or obvious damage or fault
h. Disconnecting of neon sign
i. Preparing to reconnect neon sign
j. Reconnection of neon sign
k. Testing of the reconnected neon sign for safe operation including polarity and earth continuity
l. Identifying fault(s) at point of disconnection and/or reconnection in accordance with established procedures
m. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment,

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conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to disconnecting and reconnecting fixed wired neon signs connected to a Low Voltage supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to disconnecting and reconnecting general pre-assembled types 1 and 2 cold cathode neon signs connected to supplies up to 1,000V a.c or 1,500V d.c:

Note:

Limitations of this unit. This unit does not cover installations

a. where high fault currents are possible,
b. comprised of complex electrical apparatus and circuits,
c. associated with fixed wiring including locating and rectifying faults of circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work),
d. which are luminaries,
e. in hazardous areas or on electrical equipment that is part of an explosion-protection technique.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers disconnecting and reconnecting composite appliances connected to low voltage installation wiring. This may be incidental to or a primary and regular function of work related to a principle work function. It encompasses working safely, identifying supply arrangements, following isolation procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safely testing and reporting.

The unit coverage excludes disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).

Application of the Unit

Application of the Unit **4**)

This unit applies to any formal recognition for this standard at the aligned AQF 2/3 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit requires a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Competencies needed for emergency services and equipment repair.

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to disconnect electrical equipment.	1.1	Disconnection is planned to ensure OHS policies and procedures are followed.
	1.2	Appropriate persons are consulted to ensure work is coordinated effectively with others involved in the work site.
	1.3	Safety hazards which have not previously been electrical characteristics of electrical equipment and electrical supply are determined and recorded in accordance with established procedures.
	1.4	The point of isolation of electrical equipment to be disconnected is determined.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance

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ELEMENT	PERFORMANCE CRITERIA	
		with established procedures and checked for correct operation and safety.
2 Disconnect electrical equipment.	2.1	OHS policies and procedures are followed.
	2.2	Electrical equipment is isolated in accordance with AS/NZS 4836:2001 and established procedures (see Range Statement).
	2.3	Conductor connection sequence is recorded and labelled in accordance with established procedures.
	2.4	Visual checks of the electrical equipment and associated wiring are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	2.5	Isolated equipment is confirmed as de-energised.
	2.6	Electrical equipment is disconnected from fixed wiring without damage to other components.
	2.7	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	2.8	Disconnected conductors/cables are terminated in accordance with requirements to ensure they are safe and present no potential hazard.
3 Prepare to reconnect electrical equipment.	3.1	Reconnection is planned to ensure OHS policies and procedures are followed.
	3.2	Appropriate personnel are consulted to ensure work is coordinated effectively with others involved in the work site.
	3.3	The point of isolation of the circuit to which the electrical equipment is to be connected is determined.
	3.4	Replacement electrical equipment is selected on the basis of rating and characteristics being the same as that of the original electrical equipment.
	3.5	Appropriate personnel are consulted in the event

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ELEMENT	PERFORMANCE CRITERIA	
		that replacement electrical equipment is not available.
	3.6	Original and/or replacement electrical equipment is tested to ensure it is safe to connect to the electrical supply and use.
	3.7	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
4 Reconnect electrical equipment.	4.1	OHS policies and procedures are followed.
	4.2	Measures are taken to ensure circuit to which electrical equipment is to be connected remains isolated and de-energised in accordance with AS/NZS 4836:2001.
	4.3	The continuity of the protective earthing conductor is tested to determine whether it is sufficiently low.
	4.4	The resistance between the protective earthing conductor and the neutral conductor is tested to determine whether it is sufficiently low, i.e. not greater than 2 Ohms.
	4.5	The insulation resistance of active conductors is tested to confirm that it is greater than 1 Megohm.
	4.6	An appropriate qualified person is engaged to rectify any non-compliance condition revealed by the testing under item 4.3 to 4.5.
	4.7	Continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure is confirmed.
	4.8	Electrical equipment is connected to comply with requirements.
	4.9	Connections to the equipment are checked to confirm they are correct.

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ELEMENT	PERFORMANCE CRITERIA	
5 Test the reconnected electrical equipment for safe operation.	5.1	OHS policies and procedures, and established procedures for the reinstatement of isolated circuits and electrical equipment are followed.
	5.2	Arrangements are made with appropriate personnel to test the operation of the electrical equipment in accordance with established procedures.
	5.3	Operational non-conformances are identified and reported in accordance with established procedures.
6 Identify and report faults	6.1	Electrical equipment is isolated in accordance with established procedures.
	6.2	Other OHS policies and procedures are followed.
	6.3	Visual checks of the equipment to be disconnected and/or reconnected are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	6.4	Fault(s) at point of disconnection and/or reconnection are identified and reported in accordance with established procedures.
	6.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
7 Provide status report(s).	7.1	Status report(s) are completed and notified in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and

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REQUIRED SKILLS AND KNOWLEDGE

disconnecting and reconnecting fixed wired electrical equipment connected to a Low Voltage supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP012A Electrical Safety Principles

Evidence shall show an understanding of electrical safety principles to an extent indicated by the following aspects

T1 The basic electrical circuit encompassing:

- elements of a simple electric circuit (supply, control switch, protection device and load).
- definition, the symbol and the abbreviation of the unit for electromotive force, potential difference, current, resistance
- types of electrical load
- need for devices to afford electrical protection and the mechanisms used in protection devices including resetting
- symbols for the components of a basic electrical circuit
- connection of the circuit from the schematic diagram
- a.c supply (both single and three phase) and d.c. supply
- correct connection and use of voltmeters and ammeters, including the selection of correct range in terms of magnitude and whether the supply is a.c. or d.c.
- need for isolating, testing and tagging electrical circuits
- isolation, testing and tagging accessories in a simulated environment
- connecting a simple electrical circuit including supply, control switch and load.
- measuring voltage and current within a simple circuit

T2 Relationships in an electrical circuit encompassing:

- relationship between Voltage, Current and Resistance
- connection of meters to determine resistance from voltmeter and ammeter readings using a variation of the Ohm's Law relationship
- predicting changes in circuit parameters for altered values of voltage, current and resistance
- definition of 'power' in electrical terms (for d.c. or resistive a.c. circuits)
- using circuit readings determine power using the appropriate equations, symbols and unit abbreviations including the use of multiples and sub multiples

T3 Electrical diagrams encompassing:

- symbols used for fuse, circuit breaker, isolator, normally open contacts, normally closed contacts, coil, energy meter, a.c. motor, transformer.
- using a 'block diagram' as means of developing concepts and understanding
- producing a block diagram of a simple circuit
- function of single line diagrams including their application in three phase systems

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REQUIRED SKILLS AND KNOWLEDGE

- definition of a ‘circuit’ or ‘schematic’ diagrams
- wiring diagrams
- connecting a simple circuit using a schematic diagram noting the wide degree of variety in the way the conductors may be run
- producing the wiring diagram of the connections used in following the schematic diagram
- connecting a simple circuit following a wiring diagram
- producing a schematic diagram from the wiring diagram

T4 Test equipment – selection and care encompassing:

- fault currents and the implications of incorrectly connecting a meter to a high fault current source
- category ratings of multimeters in terms of their breaking capacity (fault current interruption) and identification of the appropriate category of instrument for typical domestic work and for typical commercial work.
- regulatory requirements in regard to the maintenance and testing of test instrumentation.
- steps and procedures for the safe use, care and storage of electrical instruments.
- selecting test equipment for given situations.

T5 Test equipment - Voltage measurement encompassing:

- voltage measurement -meters connected in parallel
- operation of series test lamps
- construction of a set of series test lamps with emphasis on safety requirements
- using a set of series test lamps
- operation of neon test pencils and test screwdrivers with emphasis on the limitations of their safe use
- operation and limitations of voltage probes including their limitations
- using an analog multimeter for voltage measurement ensuring the following - setting zero, correct scale; ac or dc, polarity and magnitude, avoiding parallax error and estimating between division readings
- using a digital multimeter for voltage measurement ensuring the following - correct range and no active conductors are connected to any meter earth

T6 Test equipment - Resistance measurement encompassing:

- voltmeter-ammeter method of resistance measurement
- measuring resistance in a simple circuit using the voltmeter-ammeter method with emphasis on the correct choice of long or short shunt
- measuring resistance in a simple circuit using an analog multimeter ensuring the following - setting zero, selecting correct range, estimating of between division readings
- measureing resistance using a digital multimeter
- insulation resistance, and list the required minimum values for insulation resistance for low voltage wiring and low voltage equipment (insulation resistance

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REQUIRED SKILLS AND KNOWLEDGE

between active and earth the value for appliances incorporating heating elements)

- insulation resistance needs to be measured at higher than supply voltage and list the voltages to be used
- conducting insulation resistance tests using a hand held tester after checking for zero and meter calibration
- continuity and what a continuity tester does
- checking the polarity of a three core extension cord using a continuity tester

T7 Test equipment - Current measurement encompassing:

- advantage(s) of the clip-on method of current measurement
- measuring current in a simple circuit using a multimeter on the correct current range and explain why a series connection must be used
- measuring current using a clip-on (tong tester) taking each circuit conductor in turn.

KS02-EP012A Disconnect and Reconnect Composite Electrical Equipment

Evidence shall show an understanding of disconnect and reconnect composite electrical equipment to an extent indicated by the following aspects

T1 Cable connections encompassing:

- construction of typical power cables.
- principle of operation of the following types of terminals stud, screw, tunnel, faston and soldered
- cable preparation and terminating methods appropriate to each type of terminal, including any special requirements which apply
- terminating cables using all of the above terminal types employing the correct preparation and the relevant terminating tools including the correct size soldering equipment

T2 Protection for Safety encompassing:

- dangers associated with earth-faults.
- protection of persons against electric shock from earth-faults.
- maintaining a low earth-fault current path resistance.
- components in an earth-fault current path.
- testing the resistance of a fault-current path.
- regulatory issues/requirements/limitations in regards to working live

T3 Safety testing preparation and procedures encompassing:

- faulty earth-fault current paths
- using safe working practices when carrying out fault finding work.
- Identification of earthing system components.
- unsatisfactory resistance of a fault-current path.
- actions to rectify unsatisfactory resistance of an earth-fault current path or insulation.

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REQUIRED SKILLS AND KNOWLEDGE

T4 Isolating supplies encompassing:

- regulatory requirements in regards to working de-energised, and ensuring and maintaining isolation
- reasons for advising all personnel likely to be affected:
- preventing others wanting to remake supply
- reason for isolation and approximate time of outage to allow planning of alternate activities
- identification the type and arrangement of circuits supplying equipment that is to be disconnected
- availability of supply is tested at an appliance about to be disconnected
- locating isolation device/s e.g. lockable adjacent isolating switch or fuse/circuit breaker at a distribution board usually identified at the appliance
- determining the method of isolation to be used; which available device
- isolating a supply at a fuse, the fuse wedge is removed only after the appliance is turned off and why the empty wedge is replaced once the fusible link has been removed
- tests to determine if an appliance/equipment is turned off when isolating at a fuse/circuit breaker
- use of and reason for danger tags at the point of isolation
- reason for the following steps: testing on a known live supply, testing for isolation, retesting on a known live supply after confirming isolation

T5 Disconnecting composite electrical equipment - ELV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a ELV single phase and/or multiphase supply of voltages up to 50 V a.c. or 120 V d.c.
- procedures that ensure the safe isolation of the supply to equipment which is to be disconnected.
- disconnecting isolated equipment from fixed wiring with minimal damage to wiring system. after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T6 Reconnecting composite electrical equipment - ELV encompassing:

- importance of checking the new composite electrical equipment nameplate details against those of the composite electrical equipment being replaced
- need for high insulation resistance and the need to test insulation of 400 volt composite electrical equipment at 1000 volts and identify the minimum acceptable value of insulation resistance between active and earth generally and the value for composite electrical equipment incorporating heating elements.
- testing procedures: testing on a known live supply, testing for isolation and retesting on a known live supply after confirming isolation
- need to disconnect circuit cables before undertaking insulation resistance testing

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REQUIRED SKILLS AND KNOWLEDGE

- compliance testing the composite electrical equipment: insulation resistance test and continuity test
- need to ensure the following steps are taken when terminating cables: stranded conductors are twisted tightly together, appropriate lugs are used rather than simple loops under a nut e.g. soldered lugs or Ross Courtney, Stanco or other solderless variety, shake proof washers are used, cables are not left under physical stress, cables are protected when passing through metal openings, conductors are doubled in tunnel connectors

T7 Disconnecting composite electrical equipment - LV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures that ensure the safe isolation of the supply to equipment which is to be disconnected
- disconnection of isolated equipment from fixed wiring with minimal damage to wiring system after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T8 Reconnecting an composite electrical equipment – LV encompassing:

- importance of checking the new composite electrical equipment nameplate details against those of the composite electrical equipment being replaced
- need to visually inspect and test the equipment electrical characteristics using suitable test equipment to ensure equipment is safe to connect in regard to sufficiently high insulation resistance, arrangements for protection against indirect contact are undamaged and in place, appropriate IP rating, and arrangements for protection against dangers of mechanical movement are undamaged and in place
- compliance testing of the fixed equipment, ie insulation resistance and continuity
- testing the disconnected equipment for faults (open circuits, partial open circuits, short circuits, partial short circuits and earth faults), and recognise any unsatisfactory test results obtained
- procedures for equipment with unsatisfactory results - unsuitability for reconnection
- identification of the type and arrangement of circuits supplying equipment that is to be reconnected to a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures ensuring isolation of supply
- process to establish the integrity of the circuit to which the disconnected equipment is to be connected, including:
- testing the resistance between the protective earthing conductor and neutral conductor as applicable is sufficiently low ie not greater than 2 ohms
- insulation resistance of the active conductors is greater than 1 megohm
- engaging appropriately qualified person to rectify any noncompliance

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REQUIRED SKILLS AND KNOWLEDGE

- appropriate cable termination practices
- reconnection of equipment to fixed wiring with minimal damage to wiring system
- continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure
- restoring supply after ensuring correct connections, and all safety requirements have been met
- testing the supply at appliance / equipment
- restoring all mechanical protection eg terminal covers
- checking operation of reconnected equipment

T9 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads.
- production of reports and documents to use a suitable procedure to safely disconnect a component from a single phase supply and/or multiphase supply.
- content required in reports and documents used to safely determine the suitability of a component for reconnection to supply.
- producing reports and documents for the safe reconnection/commissioning of a component to the supply.

T10 Enterprise reporting and recording system encompassing:

- purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records for regulation requirements
- producing enterprise records and documents for the safe reconnection/commissioning of a component to the supply.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9**.**1**) Longitudinal competency development approaches to

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EVIDENCE GUIDE

assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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EVIDENCE GUIDE

shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Disconnect and reconnect fixed wired electrical equipment connected to a Low Voltage supply as described in 8) for each endorsement and including:

    A OHS practice

    B Determining electrical characteristics of equipment

    C Selecting tools, equipment, and testing devices

    D Identifying point of installation

    E Identifying and isolating circuit (including testing for safe isolation)

    F Preparing to disconnect electrical equipment

    G Undertaking visual checks of the electrical equipment and associated wiring to detect and reporting any abnormal or obvious damage or fault

    H Disconnecting of electrical equipment

    I Preparing to reconnect electrical equipment

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J Reconnection of electrical equipment

K Testing of the reconnected electrical equipment for safe operation including polarity and earth continuity

L Identifying fault(s) at point of disconnection and/or reconnection in accordance with established procedures

M Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to disconnecting and reconnecting fixed wired electrical equipment connected to a Low Voltage

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supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to disconnecting and reconnecting composite equipment incorporating one or more current-using devices and/or controls connected to supplies up to 1,000 V a.c or 1,500 V d.c:

Note:

Limitations of this unit. This unit does not cover installations

a) where high fault currents are possible,

b) comprised of complex electrical apparatus and circuits,

c) associated with fixed wiring including locating and rectifying faults of circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work),

d) which are luminaires,

e) in hazardous areas or on electrical equipment that is part of an explosion-protection technique.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836:2001 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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2.2) Literacy and numeracy skills

2.2) Literacy and numeracy skills

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Competency Field

Competency Field **5**)

Restricted and Specialisations

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UEENEEP013A Disconnect - reconnect control devices connected to low voltage installation wiring

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers disconnecting and reconnecting control devices connected to low voltage installation wiring. This may be incidental to or a primary and regular function of work related to a principle work function. It encompasses working safely, identifying supply arrangements, following isolation procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safely testing and reporting.

The unit coverage excludes disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).

Application of the Unit

Application of the Unit

2)

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit requires a

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License to practice **3)**

license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Competencies needed for emergency services and equipment repair.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to disconnect control devices	1.1	Disconnection is planned to ensure OHS policies and procedures are followed.
	1.2	Appropriate persons are consulted to ensure work is coordinated effectively with others involved in the work site.
	1.3	Safety hazards which have not previously been electrical characteristics of control devices and electrical supply are determined and recorded in accordance with established procedures.
	1.4	The point of isolation of control devices to be disconnected is determined.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for

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ELEMENT	PERFORMANCE CRITERIA	
		correct operation and safety.
2 Disconnect control devices	2.1	OHS policies and procedures are followed.
	2.2	Control devices are isolated in accordance with AS/NZS 4836 and established procedures (see Range Statement).
	2.3	Conductor connection sequence is recorded and labelled in accordance with established procedures.
	2.4	Visual checks of the control devices and associated wiring are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	2.5	Isolated equipment is confirmed as de-energised.
	2.6	Control devices are disconnected from fixed wiring without damage to other components.
	2.7	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	2.8	Disconnected conductors/cables are terminated in accordance with requirements to ensure they are safe and present no potential hazard.
3 Prepare to reconnect control devices	3.1	Reconnection is planned to ensure OHS policies and procedures are followed.
	3.2	Appropriate personnel are consulted to ensure work is coordinated effectively with others involved in the work site.
	3.3	The point of isolation of the circuit to which the control devices is to be connected is determined.
	3.4	Replacement control devices are selected on the basis of rating and characteristics being the same as that of the original control devices.
	3.5	Appropriate personnel are consulted in the event that replacement control devices are not

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ELEMENT	PERFORMANCE CRITERIA	
		available.
	3.6	Original and/or replacement control devices is tested to ensure it is safe to connect to the electrical supply and use.
	3.7	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
4 Reconnect control devices	4.1	OHS policies and procedures are followed.
	4.2	Measures are taken to ensure circuit to which control devices is to be connected remains isolated and de-energised in accordance with AS/NZS 4836.
	4.3	The continuity of the protective earthing conductor is tested to determine whether it is sufficiently low.
	4.4	The resistance between the protective earthing conductor and the neutral conductor is tested to determine whether it is sufficiently low, i.e. not greater than 2 Ohms.
	4.5	The insulation resistance of active conductors is tested to confirm that it is greater than 1 Megohm.
	4.6	An appropriate qualified person is engaged to rectify any non-compliance condition revealed by the testing under item 4.3 to 4.5.
	4.7	Continuity between exposed conductive parts of the appliance and the main earth or metal switchboard enclosure is confirmed.
	4.8	Control devices are connected to comply with requirements.
	4.9	Connections to the appliance are checked to confirm they are correct.

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ELEMENT	PERFORMANCE CRITERIA	
5 Test the reconnected control devices for safe operation	5.1	OHS policies and procedures, and established procedures for the reinstatement of isolated circuits and control devices are followed.
	5.2	Arrangements are made with appropriate personnel to test the operation of the control devices in accordance with established procedures.
	5.3	Operational non-conformances are identified and reported in accordance with established procedures.
6 Identify and report faults	6.1	Control devices are isolated in accordance with established procedures.
	6.2	Other OHS policies and procedures are followed.
	6.3	Visual checks of the control devices to be disconnected and/or reconnected are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	6.4	Fault(s) at point of disconnection and/or reconnection are identified and reported in accordance with established procedures.
	6.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
7 Provide status report(s)	7.1	Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and disconnecting and reconnecting fixed wired control devices connected to a Low Voltage supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP013A Electrical Safety Principles

Evidence shall show an understanding of electrical safety principles to an extent indicated by the following aspects

T1 The basic electrical circuit encompassing:

- elements of a simple electric circuit (supply, control switch, protection device and load).
- definition, the symbol and the abbreviation of the unit for electromotive force, potential difference, current, resistance
- types of electrical load
- need for devices to afford electrical protection and the mechanisms used in protection devices including resetting
- symbols for the components of a basic electrical circuitconnection of the circuit from the schematic diagram
- a.c supply (both single and three phase) and d.c. supply
- correct connection and use of voltmeters and ammeters, including the selection of correct range in terms of magnitude and whether the supply is a.c. or d.c.
- need for isolating, testing and tagging electrical circuits
- isolation, testing and tagging accessories in a simulated environment
- connecting a simple electrical circuit including supply, control switch and load.
- measuring voltage and current within a simple circuit

T2 Relationships in an electrical circuit encompassing:

- relationship between Voltage, Current and Resistance
- connection of meters to determine resistance from voltmeter and ammeter readings using a variation of the Ohm’s Law relationship
- predicting changes in circuit parameters for altered values of voltage, current and resistance
- definition of ‘power’ in electrical terms (for d.c. or resistive a.c. circuits)
- using circuit readings determine power using the appropriate equations, symbols and unit abbreviations including the use of multiples and sub multiples

T3 Electrical diagrams encompassing:

- symbols used for fuse, circuit breaker, isolator, normally open contacts, normally

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REQUIRED SKILLS AND KNOWLEDGE

closed contacts, coil, energy meter, a.c. motor, transformer.

- using a ‘block diagram’ as means of developing concepts and understanding
- producing a block diagram of a simple circuit
- function of single line diagrams including their application in three phase systems
- definition of a ‘circuit’ or ‘schematic’ diagrams
- wiring diagrams
- connecting a simple circuit using a schematic diagram noting the wide degree of variety in the way the conductors may be run
- producing the wiring diagram of the connections used in following the schematic diagram
- connecting a simple circuit following a wiring diagram
- producing a schematic diagram from the wiring diagram

T4 Test equipment – selection and care encompassing:

- fault currents and the implications of incorrectly connecting a meter to a high fault current source
- category ratings of multimeters in terms of their breaking capacity (fault current interruption) and identification of the appropriate category of instrument for typical domestic work and for typical commercial work.
- regulatory requirements in regard to the maintenance and testing of test instrumentation.
- steps and procedures for the safe use, care and storage of electrical instruments.
- selecting test equipment for given situations.

T5 Test equipment - Voltage measurement encompassing:

- voltage measurement -meters connected in parallel
- operation of series test lamps
- construction of a set of series test lamps with emphasis on safety requirements
- using a set of series test lamps
- operation of neon test pencils and test screwdrivers with emphasis on the limitations of their safe use
- operation and limitations of voltage probes including their limitations
- using an analog multimeter for voltage measurement ensuring the following - setting zero, correct scale; ac or dc, polarity and magnitude, avoiding parallax error and estimating between division readings
- using a digital multimeter for voltage measurement ensuring the following - correct range and no active conductors are connected to any meter earth

T6 Test equipment - Resistance measurement encompassing:

- voltmeter-ammeter method of resistance measurement
- measuring resistance in a simple circuit using the voltmeter-ammeter method with emphasis on the correct choice of long or short shunt
- measuring resistance in a simple circuit using an analog multimeter ensuring the following - setting zero, selecting correct range, estimating of between division

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REQUIRED SKILLS AND KNOWLEDGE

readings

- measureing resistance using a digital multimeter
- insulation resistance, and list the required minimum values for insulation resistance for low voltage wiring and low voltage equipment (insulation resistance between active and earth the value for appliances incorporating heating elements)
- insulation resistance needs to be measured at higher than supply voltage and list the voltages to be used
- conducting insulation resistance tests using a hand held tester after checking for zero and meter calibration
- continuity and what a continuity tester does
- checking the polarity of a three core extension cord using a continuity tester

T7 Test equipment - Current measurement encompassing:

- advantage(s) of the clip-on method of current measurement
- measuring current in a simple circuit using a multimeter on the correct current range and explain why a series connection must be used
- measuring current using a clip-on (tong tester) taking each circuit conductor in turn.

KS02-EP013A Disconnect and Reconnect Control Devices

Evidence shall show an understanding of disconnect and reconnect control devices to an extent indicated by the following aspects

T1 Cable connections encompassing:

- construction of typical power cables.
- principle of operation of the following types of terminals stud, screw, tunnel, faston and soldered
- cable preparation and terminating methods appropriate to each type of terminal, including any special requirements which apply
- terminating cables using all of the above terminal types employing the correct preparation and the relevant terminating tools including the correct size soldering equipment

T2 Protection for Safety encompassing:

- dangers associated with earth-faults.
- protection of persons against electric shock from earth-faults.
- maintaining a low earth-fault current path resistance.
- components in an earth-fault current path.
- testing the resistance of a fault-current path.
- regulatory issues/requirements/limitations in regards to working live

T3 Safety testing preparation and procedures encompassing:

- faulty earth-fault current paths
- using safe working practices when carrying out fault finding work.

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REQUIRED SKILLS AND KNOWLEDGE

- Identification of earthing system components.
- unsatisfactory resistance of a fault-current path.
- actions to rectify unsatisfactory resistance of an earth-fault current path or insulation.

T4 Isolating supplies encompassing:

- regulatory requirements in regards to working de-energised, and ensuring and maintaining isolation
- reasons for advising all personnel likely to be affected:
- preventing others wanting to remake supply
- reason for isolation and approximate time of outage to allow planning of alternate activities
- identification the type and arrangement of circuits supplying equipment that is to be disconnected
- availability of supply is tested at an control devices about to be disconnected
- locating isolation device/s e.g. lockable adjacent isolating switch or fuse/circuit breaker at a distribution board usually identified at the control device
- determining the method of isolation to be used; which available device
- isolating a supply at a fuse, the fuse wedge is removed only after the control device is turned off and why the empty wedge is replaced once the fusible link has been removed
- tests to determine if an control device is turned off when isolating at a fuse/circuit breaker
- use of and reason for danger tags at the point of isolation
- reason for the following steps: testing on a known live supply, testing for isolation, retesting on a known live supply after confirming isolation

T5 Disconnecting an control device - ELV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a ELV single phase and/or multiphase supply of voltages up to 50 V a.c. or 120 V d.c.
- procedures that ensure the safe isolation of the supply to control device which is to be disconnected.
- disconnecting isolated electrical control device from fixed wiring with minimal damage to wiring system. after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T6 Reconnecting an control device - ELV encompassing:

- importance of checking the new electrical control device nameplate details against those of the control device being replaced
- need for high insulation resistance and the need to test insulation of 400 volt control device at 1000 volts and identify the minimum acceptable value of insulation resistance between active.

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REQUIRED SKILLS AND KNOWLEDGE

- testing procedures: testing on a known live supply, testing for isolation and retesting on a known live supply after confirming isolation
- need to disconnect circuit cables before undertaking insulation resistance testing
- compliance testing the control device: insulation resistance test and continuity test
- need to ensure the following steps are taken when terminating cables: stranded conductors are twisted tightly together, appropriate lugs are used rather than simple loops under a nut e.g. soldered lugs or Ross Courtney, Stanco or other solderless variety, shake proof washers are used, cables are not left under physical stress, cables are protected when passing through metal openings, conductors are doubled in tunnel connectors

T7 Disconnecting an control devices - LV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures that ensure the safe isolation of the supply to equipment which is to be disconnected
- disconnection of isolated equipment from fixed wiring with minimal damage to wiring system after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T8 Reconnecting an control device – LV encompassing:

- importance of checking the new control device nameplate details against those of the electrical control devices being replaced
- need to visually inspect and test the control device electrical characteristics using suitable test equipment to ensure equipment is safe to connect in regard to sufficiently high insulation resistance, arrangements for protection against indirect contact are undamaged and in place, appropriate IP rating, and arrangements for protection against dangers of mechanical movement are undamaged and in place
- compliance testing of the fixed control device, ie insulation resistance and continuity
- testing the disconnected control devices for faults (open circuits, partial open circuits, short circuits, partial short circuits and earth faults), and recognise any unsatisfactory test results obtained
- procedures for equipment with unsatisfactory results - unsuitability for reconnection
- identification of the type and arrangement of circuits supplying equipment that is to be reconnected to a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures ensuring isolation of supply
- process to establish the integrity of the circuit to which the disconnected equipment is to be connected, including:
- testing the resistance between the protective earthing conductor and neutral

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REQUIRED SKILLS AND KNOWLEDGE

conductor as applicable is sufficiently low ie not greater than 2 ohms

- insulation resistance of the active conductors is greater than 1 megohm
- engaging appropriately qualified person to rectify any noncompliance
- appropriate cable termination practices
- reconnection of control device to fixed wiring with minimal damage to wiring system
- continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure
- restoring supply after ensuring correct connections, and all safety requirements have been met
- testing the supply at control device
- restoring all mechanical protection eg terminal covers
- checking operation of reconnected equipment

T9 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads.
- production of reports and documents to use a suitable procedure to safely disconnect a component from a single phase supply and/or multiphase supply.
- content required in reports and documents used to safely determine the suitability of a component for reconnection to supply.
- producing reports and documents for the safe reconnection/commissioning of a component to the supply.

T10 Enterprise reporting and recording system encompassing:

- purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records for regulation requirements
- producing enterprise records and documents for the safe reconnection/commissioning of a component to the supply.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- • A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- • Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Disconnect and reconnect fixed wired control devices connected to a Low Voltage supply as described in 8) for each endorsement and including:

  a. OHS practice

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b. Determining electrical characteristics of control devices
c. Selecting tools, equipment, and testing devices
d. Identifying point of installation
e. Identifying and isolating circuit (including testing for safe isolation)
f. Preparing to disconnect control devices
g. Undertaking visual checks of the control devices and associated wiring to detect and reporting any abnormal or obvious damage or fault
h. Disconnecting of control devices
i. Preparing to reconnect control devices
j. Reconnection of control devices
k. Testing of the reconnected control devices for safe operation including polarity and earth continuity
l. Identifying fault(s) at point of disconnection and/or reconnection in accordance with established procedures
m. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment

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environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to disconnecting and reconnecting fixed wired control devices connected to a Low Voltage supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to disconnecting and reconnecting control devices connected to supplies up to 1,000V a.c or 1,500V d.c:

Note:

Limitations of this unit. This unit does not cover installations

a. where high fault currents are possible,
b. comprised of complex electrical apparatus and circuits,
c. associated with fixed wiring including locating and rectifying faults of circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work),
d. which are luminaries,
e. in hazardous areas or on electrical equipment that is part of an explosion-protection technique.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836 ‘Safe working on low-voltage electrical installations.’

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP014A Disconnect - reconnect water heaters connected to low voltage installation wiring

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers disconnecting and reconnecting water heaters connected to low voltage installation wiring. This may be incidental to or a primary and regular function of work related to a principle work function. It encompasses working safely, identifying supply arrangements, following isolation procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safely testing and reporting.

The unit coverage excludes disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc.); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).

Application of the Unit

Application of the Unit **2)**

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit requires a

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License to practice **3)**

license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Competencies needed for emergency services and equipment repair.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to disconnect water heaters	1.1	Disconnection is planned to ensure OHS policies and procedures are followed.
	1.2	Appropriate persons are consulted to ensure work is coordinated effectively with others involved in the work site.
	1.3	Safety hazards which have not previously been electrical characteristics of water heaters and electrical supply are determined and recorded in accordance with established procedures.
	1.4	The point of isolation of water heaters to be disconnected is determined.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for

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ELEMENT	PERFORMANCE CRITERIA	
		correct operation and safety.
2 Disconnect water heaters	2.1	OHS policies and procedures are followed.
	2.2	Water heaters are isolated in accordance with AS/NZS 4836:2001 and established procedures (see Range Statement).
	2.3	Conductor connection sequence is recorded and labelled in accordance with established procedures.
	2.4	Visual checks of the water heaters and associated wiring are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	2.5	Isolated equipment is confirmed as de-energised.
	2.6	Water heaters are disconnected from fixed wiring without damage to other components.
	2.7	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	2.8	Disconnected conductors/cables are terminated in accordance with requirements to ensure they are safe and present no potential hazard.
3 Prepare to reconnect water heaters	3.1	Reconnection is planned to ensure OHS policies and procedures are followed.
	3.2	Appropriate personnel are consulted to ensure work is coordinated effectively with others involved in the work site.
	3.3	The point of isolation of the circuit to which the water heaters is to be connected is determined.
	3.4	Replacement water heaters are selected on the basis of rating and characteristics being the same as that of the original water heaters.
	3.5	Appropriate personnel are consulted in the event that replacement water heaters are not available.

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ELEMENT	PERFORMANCE CRITERIA	
	3.6	Original and/or replacement water heaters are tested to ensure it is safe to connect to the electrical supply and use.
	3.7	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
4 Reconnect water heaters	4.1	OHS policies and procedures are followed.
	4.2	Measures are taken to ensure circuit to which water heaters is to be connected remains isolated and de-energised in accordance with AS/NZS 4836:2001.
	4.3	The continuity of the protective earthing conductor is tested to determine whether it is sufficiently low.
	4.4	The resistance between the protective earthing conductor and the neutral conductor is tested to determine whether it is sufficiently low, i.e. not greater than 2 Ohms.
	4.5	The insulation resistance of active conductors is tested to confirm that it is greater than 1 Megohm.
	4.6	An appropriate qualified person is engaged to rectify any non-compliance condition revealed by the testing under item 4.3 to 4.5.
	4.7	Continuity between exposed conductive parts of the appliance and the main earth or metal switchboard enclosure is confirmed.
	4.8	Water heaters are connected to comply with requirements.
	4.9	Connections to the appliance are checked to confirm they are correct.

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ELEMENT	PERFORMANCE CRITERIA	
5 Test the reconnected water heaters for safe operation	5.1	OHS policies and procedures, and established procedures for the reinstatement of isolated circuits and water heaters are followed.
	5.2	Arrangements are made with appropriate personnel to test the operation of the water heaters in accordance with established procedures.
	5.3	Operational non-conformances are identified and reported in accordance with established procedures.
6 Identify and report faults	6.1	Water heaters are isolated in accordance with established procedures.
	6.2	Other OHS policies and procedures are followed.
	6.3	Visual checks of the appliance to be disconnected and/or reconnected are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	6.4	Fault(s) at point of disconnection and/or reconnection are identified and reported in accordance with established procedures.
	6.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
7 Provide status report(s)	7.1	Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and disconnecting and reconnecting fixed wired water heaters connected to a Low Voltage supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP014A Electrical Safety Principles

Evidence shall show an understanding of electrical safety principles to an extent indicated by the following aspects

T1 The basic electrical circuit encompassing:

- elements of a simple electric circuit (supply, control switch, protection device and load).
- definition, the symbol and the abbreviation of the unit for electromotive force, potential difference, current, resistance
- types of electrical load
- need for devices to afford electrical protection and the mechanisms used in protection devices including resetting
- symbols for the components of a basic electrical circuit
- connection of the circuit from the schematic diagram
- a.c supply (both single and three phase) and d.c. supply
- correct connection and use of voltmeters and ammeters, including the selection of correct range in terms of magnitude and whether the supply is a.c. or d.c.
- need for isolating, testing and tagging electrical circuits
- isolation, testing and tagging accessories in a simulated environment
- connecting a simple electrical circuit including supply, control switch and load.
- measuring voltage and current within a simple circuit

T2 Relationships in an electrical circuit encompassing:

- relationship between Voltage, Current and Resistance
- connection of meters to determine resistance from voltmeter and ammeter readings using a variation of the Ohm’s Law relationship
- predicting changes in circuit parameters for altered values of voltage, current and resistance
- definition of ‘power’ in electrical terms (for d.c. or resistive a.c. circuits)
- using circuit readings determine power using the appropriate equations, symbols and unit abbreviations including the use of multiples and sub multiples

T3 Electrical diagrams encompassing:

- symbols used for fuse, circuit breaker, isolator, normally open contacts, normally

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REQUIRED SKILLS AND KNOWLEDGE

closed contacts, coil, energy meter, a.c. motor, transformer.

- using a ‘block diagram’ as means of developing concepts and understanding
- producing a block diagram of a simple circuit
- function of single line diagrams including their application in three phase systems
- definition of a ‘circuit’ or ‘schematic’ diagrams
- wiring diagrams
- connecting a simple circuit using a schematic diagram noting the wide degree of variety in the way the conductors may be run
- producing the wiring diagram of the connections used in following the schematic diagram
- connecting a simple circuit following a wiring diagram
- producing a schematic diagram from the wiring diagram

T4 Test equipment – selection and care encompassing:

- fault currents and the implications of incorrectly connecting a meter to a high fault current source
- category ratings of multimeters in terms of their breaking capacity (fault current interruption) and identification of the appropriate category of instrument for typical domestic work and for typical commercial work.
- regulatory requirements in regard to the maintenance and testing of test instrumentation.
- steps and procedures for the safe use, care and storage of electrical instruments.
- selecting test equipment for given situations

T5 Test equipment - Voltage measurement encompassing:

- voltage measurement -meters connected in parallel
- operation of series test lamps
- construction of a set of series test lamps with emphasis on safety requirements
- using a set of series test lamps
- operation of neon test pencils and test screwdrivers with emphasis on the limitations of their safe use
- operation and limitations of voltage probes including their limitations
- using an analog multimeter for voltage measurement ensuring the following - setting zero, correct scale; ac or dc, polarity and magnitude, avoiding parallax error and estimating between division readings
- using a digital multimeter for voltage measurement ensuring the following - correct range and no active conductors are connected to any meter earth

T6 Test equipment - Resistance measurement encompassing:

- voltmeter-ammeter method of resistance measurement
- measuring resistance in a simple circuit using the voltmeter-ammeter method with emphasis on the correct choice of long or short shunt
- measuring resistance in a simple circuit using an analog multimeter ensuring the following - setting zero, selecting correct range, estimating of between division

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REQUIRED SKILLS AND KNOWLEDGE

readings

- measureing resistance using a digital multimeter
- insulation resistance, and list the required minimum values for insulation resistance for low voltage wiring and low voltage equipment (insulation resistance between active and earth the value for appliances incorporating heating elements)
- insulation resistance needs to be measured at higher than supply voltage and list the voltages to be used
- conducting insulation resistance tests using a hand held tester after checking for zero and meter calibration
- continuity and what a continuity tester does
- checking the polarity of a three core extension cord using a continuity tester

T7 Test equipment - Current measurement encompassing:

- advantage(s) of the clip-on method of current measurement
- measuring current in a simple circuit using a multimeter on the correct current range and explain why a series connection must be used
- measuring current using a clip-on (tong tester) taking each circuit conductor in turn.

KS02-EP014A Disconnect and Reconnect Water Heaters

Evidence shall show an understanding of disconnect and reconnect water heaters to an extent indicated by the following aspects

T1 Cable connections encompassing:

- construction of typical power cables.
- principle of operation of the following types of terminals stud, screw, tunnel, faston and soldered
- cable preparation and terminating methods appropriate to each type of terminal, including any special requirements which apply
- terminating cables using all of the above terminal types employing the correct preparation and the relevant terminating tools including the correct size soldering equipment

T2 Protection for Safety encompassing:

- dangers associated with earth-faults.
- protection of persons against electric shock from earth-faults.
- maintaining a low earth-fault current path resistance.
- components in an earth-fault current path.
- testing the resistance of a fault-current path.
- regulatory issues/requirements/limitations in regards to working live

T3 Safety testing preparation and procedures encompassing:

- faulty earth-fault current paths
- using safe working practices when carrying out fault finding work.

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REQUIRED SKILLS AND KNOWLEDGE

- Identification of earthing system components.
- unsatisfactory resistance of a fault-current path.
- actions to rectify unsatisfactory resistance of an earth-fault current path or insulation.

T4 Isolating supplies encompassing:

- regulatory requirements in regards to working de-energised, and ensuring and maintaining isolation
- reasons for advising all personnel likely to be affected:
- preventing others wanting to remake supply
- reason for isolation and approximate time of outage to allow planning of alternate activities
- identification the type and arrangement of circuits supplying equipment that is to be disconnected
- availability of supply is tested at an water heater about to be disconnected
- locating isolation device/s e.g. lockable adjacent isolating switch or fuse/circuit breaker at a distribution board usually identified at the water heater
- determining the method of isolation to be used; which available device
- isolating a supply at a fuse, the fuse wedge is removed only after the water heater is turned off and why the empty wedge is replaced once the fusible link has been removed
- tests to determine if an water heater is turned off when isolating at a fuse/circuit breaker
- use of and reason for danger tags at the point of isolation
- reason for the following steps: testing on a known live supply, testing for isolation, retesting on a known live supply after confirming isolation

T5 Disconnecting an water heater - ELV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a ELV single phase and/or multiphase supply of voltages up to 50 V a.c. or 120 V d.c.
- procedures that ensure the safe isolation of the supply to water heater which is to be disconnected.
- disconnecting isolated electrical water heater from fixed wiring with minimal damage to wiring system. after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T6 Reconnecting an water heater - ELV encompassing:

- importance of checking the new electrical water heater nameplate details against those of the water heater being replaced
- need for high insulation resistance and the need to test insulation of 400 volt water heater at 1000 volts and identify the minimum acceptable value of insulation resistance between active.

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REQUIRED SKILLS AND KNOWLEDGE

- testing procedures: testing on a known live supply, testing for isolation and retesting on a known live supply after confirming isolation
- need to disconnect circuit cables before undertaking insulation resistance testing
- compliance testing the water heater: insulation resistance test and continuity test
- need to ensure the following steps are taken when terminating cables: stranded conductors are twisted tightly together, appropriate lugs are used rather than simple loops under a nut e.g. soldered lugs or Ross Courtney, Stanco or other solderless variety, shake proof washers are used, cables are not left under physical stress, cables are protected when passing through metal openings, conductors are doubled in tunnel connectors

T7 Disconnecting an water heaters - LV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures that ensure the safe isolation of the supply to equipment which is to be disconnected
- disconnection of isolated equipment from fixed wiring with minimal damage to wiring system after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T8 Reconnecting an water heater – LV encompassing:

- importance of checking the new water heater nameplate details against those of the electrical water heater being replaced
- need to visually inspect and test the water heater electrical characteristics using suitable test equipment to ensure equipment is safe to connect in regard to sufficiently high insulation resistance, arrangements for protection against indirect contact are undamaged and in place, appropriate IP rating, and arrangements for protection against dangers of mechanical movement are undamaged and in place
- compliance testing of the fixed water heater, ie insulation resistance and continuity
- testing the disconnected water heater for faults (open circuits, partial open circuits, short circuits, partial short circuits and earth faults), and recognise any unsatisfactory test results obtained
- procedures for equipment with unsatisfactory results - unsuitability for reconnection
- identification of the type and arrangement of circuits supplying equipment that is to be reconnected to a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures ensuring isolation of supply
- process to establish the integrity of the circuit to which the disconnected equipment is to be connected, including:
- testing the resistance between the protective earthing conductor and neutral conductor as applicable is sufficiently low ie not greater than 2 ohms

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REQUIRED SKILLS AND KNOWLEDGE

- insulation resistance of the active conductors is greater than 1 megohm
- engaging appropriately qualified person to rectify any noncompliance
- appropriate cable termination practices
- reconnection of water heater to fixed wiring with minimal damage to wiring system
- continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure
- restoring supply after ensuring correct connections, and all safety requirements have been met
- testing the supply at water heater
- restoring all mechanical protection eg terminal covers
- checking operation of reconnected equipment

T9 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads.
- production of reports and documents to use a suitable procedure to safely disconnect a component from a single phase supply and/or multiphase supply.
- content required in reports and documents used to safely determine the suitability of a component for reconnection to supply.
- producing reports and documents for the safe reconnection/commissioning of a component to the supply.

T10 Enterprise reporting and recording system encompassing:

- purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records for regulation requirements
- producing enterprise records and documents for the safe reconnection/commissioning of a component to the supply.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Disconnect and reconnect fixed wired water heaters connected to a Low Voltage supply as described in 8) for each endorsement and including:

    a. OHS practice

    b. Determining electrical characteristics of water heaters

    c. Selecting tools, equipment, and testing devices

    d. Identifying point of installation

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e. Identifying and isolating circuit (including testing for safe isolation)
f. Preparing to disconnect water heaters
g. Undertaking visual checks of the water heaters and associated wiring to detect and reporting any abnormal or obvious damage or fault
h. Disconnecting of water heaters
i. Preparing to reconnect water heaters
j. Reconnection of water heaters
k. Testing of the reconnected water heaters for safe operation including polarity and earth continuity
l. Identifying fault(s) at point of disconnection and/or reconnection in accordance with established procedures
m. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment,

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conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to disconnecting and reconnecting fixed wired water heaters connected to a Low Voltage supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to disconnecting and reconnecting water heaters connected to supplies up to 1,000V a.c or 1,500V d.c:

Note:

Limitations of this unit. This unit does not cover installations

a. where high fault currents are possible,
b. comprised of complex electrical apparatus and circuits,
c. associated with fixed wiring including locating and rectifying faults of circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work),
d. which are luminaries,
e. in hazardous areas or on electrical equipment that is part of an explosion-protection technique.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836:2001 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP015A Disconnect - reconnect motors connected to low voltage installation wiring

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers disconnecting and reconnecting motors connected to low voltage installation wiring. This may be incidental to or a primary and regular function of work related to a principle work function. It encompasses working safely, identifying supply arrangements, following isolation procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safely testing and reporting.

The unit coverage excludes disconnecting or reconnecting circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc.); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).

Application of the Unit

Application of the Unit

2)

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit requires a

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License to practice **3)**

license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Competencies needed for emergency services and equipment repair.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to disconnect motors	1.1	Disconnection is planned to ensure OHS policies and procedures are followed.
	1.2	Appropriate persons are consulted to ensure work is coordinated effectively with others involved in the work site.
	1.3	Safety hazards which have not previously been electrical characteristics of motors and electrical supply are determined and recorded in accordance with established procedures.
	1.4	The point of isolation of motors to be disconnected is determined.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for

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ELEMENT		PERFORMANCE CRITERIA	
			correct operation and safety.
2	Disconnect motors	2.1	OHS policies and procedures are followed.
		2.2	Motors are isolated in accordance with AS/NZS 4836:2001 and established procedures (see Range Statement).
		2.3	Conductor connection sequence is recorded and labelled in accordance with established procedures.
		2.4	Visual checks of the motors and associated wiring are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
		2.5	Isolated equipment is confirmed as de-energised.
		2.6	Motors are disconnected from fixed wiring without damage to other components.
		2.7	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
		2.8	Disconnected conductors/cables are terminated in accordance with requirements to ensure they are safe and present no potential hazard.
3	Prepare to reconnect motors	3.1	Reconnection is planned to ensure OHS policies and procedures are followed.
		3.2	Appropriate personnel are consulted to ensure work is coordinated effectively with others involved in the work site.
		3.3	The point of isolation of the circuit to which the motors is to be connected is determined.
		3.4	Replacement motors are selected on the basis of rating and characteristics being the same as that of the original motors.
		3.5	Appropriate personnel are consulted in the event that replacement motors are not available.

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ELEMENT	PERFORMANCE CRITERIA	
	3.6	Original and/or replacement motors are tested to ensure it is safe to connect to the electrical supply and use.
	3.7	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
4 Reconnect motors	4.1	OHS policies and procedures are followed.
	4.2	Measures are taken to ensure circuit to which motors is to be connected remains isolated and de-energised in accordance with AS/NZS 4836:2001.
	4.3	The continuity of the protective earthing conductor is tested to determine whether it is sufficiently low.
	4.4	The resistance between the protective earthing conductor and the neutral conductor is tested to determine whether it is sufficiently low, i.e. not greater than 2 Ohms.
	4.5	The insulation resistance of active conductors is tested to confirm that it is greater than 1 Megohm.
	4.6	An appropriate qualified person is engaged to rectify any non-compliance condition revealed by the testing under item 4.3 to 4.5.
	4.7	Continuity between exposed conductive parts of the appliance and the main earth or metal switchboard enclosure is confirmed.
	4.8	Motors are connected to comply with requirements.
	4.9	Connections to the appliance are checked to confirm they are correct.

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ELEMENT	PERFORMANCE CRITERIA	
5 Test the reconnected motors for safe operation	5.1	OHS policies and procedures, and established procedures for the reinstatement of isolated circuits and motors are followed.
	5.2	Arrangements are made with appropriate personnel to test the operation of the motors in accordance with established procedures.
	5.3	Operational non-conformances are identified and reported in accordance with established procedures.
6 Identify and report faults	6.1	Motors are isolated in accordance with established procedures.
	6.2	Other OHS policies and procedures are followed.
	6.3	Visual checks of the appliance to be disconnected and/or reconnected are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	6.4	Fault(s) at point of disconnection and/or reconnection are identified and reported in accordance with established procedures.
	6.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
7 Provide status report(s)	7.1	Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and disconnecting and reconnecting fixed wired motors connected to a Low Voltage supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP015A Electrical Safety Principles

Evidence shall show an understanding of electrical safety principles to an extent indicated by the following aspects

T1 The basic electrical circuit encompassing:

- elements of a simple electric circuit (supply, control switch, protection device and load).
- definition, the symbol and the abbreviation of the unit for electromotive force, potential difference, current, resistance
- types of electrical load
- need for devices to afford electrical protection and the mechanisms used in protection devices including resetting
- symbols for the components of a basic electrical circuit
- connection of the circuit from the schematic diagram
- a.c supply (both single and three phase) and d.c. supply
- correct connection and use of voltmeters and ammeters, including the selection of correct range in terms of magnitude and whether the supply is a.c. or d.c.
- need for isolating, testing and tagging electrical circuits
- isolation, testing and tagging accessories in a simulated environment
- connecting a simple electrical circuit including supply, control switch and load.
- measuring voltage and current within a simple circuit

T2 Relationships in an electrical circuit encompassing:

- relationship between Voltage, Current and Resistance
- connection of meters to determine resistance from voltmeter and ammeter readings using a variation of the Ohm’s Law relationship
- predicting changes in circuit parameters for altered values of voltage, current and resistance
- definition of ‘power’ in electrical terms (for d.c. or resistive a.c. circuits)
- using circuit readings determine power using the appropriate equations, symbols and unit abbreviations including the use of multiples and sub multiples

T3 Electrical diagrams encompassing:

- symbols used for fuse, circuit breaker, isolator, normally open contacts, normally

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REQUIRED SKILLS AND KNOWLEDGE

closed contacts, coil, energy meter, a.c. motor, transformer.

- using a ‘block diagram’ as means of developing concepts and understanding
- producing a block diagram of a simple circuit
- function of single line diagrams including their application in three phase systems
- definition of a ‘circuit’ or ‘schematic’ diagrams
- wiring diagrams
- connecting a simple circuit using a schematic diagram noting the wide degree of variety in the way the conductors may be run
- producing the wiring diagram of the connections used in following the schematic diagram
- connecting a simple circuit following a wiring diagram
- producing a schematic diagram from the wiring diagram

T4 Test equipment – selection and care encompassing:

- fault currents and the implications of incorrectly connecting a meter to a high fault current source
- category ratings of multimeters in terms of their breaking capacity (fault current interruption) and identification of the appropriate category of instrument for typical domestic work and for typical commercial work.
- regulatory requirements in regard to the maintenance and testing of test instrumentation.
- steps and procedures for the safe use, care and storage of electrical instruments.
- selecting test equipment for given situations.

T5 Test equipment - Voltage measurement encompassing:

- voltage measurement -meters connected in parallel
- operation of series test lamps
- construction of a set of series test lamps with emphasis on safety requirements
- using a set of series test lamps
- operation of neon test pencils and test screwdrivers with emphasis on the limitations of their safe use
- operation and limitations of voltage probes including their limitations
- using an analog multimeter for voltage measurement ensuring the following - setting zero, correct scale; ac or dc, polarity and magnitude, avoiding parallax error and estimating between division readings
- using a digital multimeter for voltage measurement ensuring the following - correct range and no active conductors are connected to any meter earth

T6 Test equipment - Resistance measurement encompassing:

- voltmeter-ammeter method of resistance measurement
- measuring resistance in a simple circuit using the voltmeter-ammeter method with emphasis on the correct choice of long or short shunt
- measuring resistance in a simple circuit using an analog multimeter ensuring the following - setting zero, selecting correct range, estimating of between division

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REQUIRED SKILLS AND KNOWLEDGE

readings

- measureing resistance using a digital multimeter
- insulation resistance, and list the required minimum values for insulation resistance for low voltage wiring and low voltage equipment (insulation resistance between active and earth the value for appliances incorporating heating elements)
- insulation resistance needs to be measured at higher than supply voltage and list the voltages to be used
- conducting insulation resistance tests using a hand held tester after checking for zero and meter calibration
- continuity and what a continuity tester does
- checking the polarity of a three core extension cord using a continuity tester

T7 Test equipment - Current measurement encompassing:

- advantage(s) of the clip-on method of current measurement
- measuring current in a simple circuit using a multimeter on the correct current range and explain why a series connection must be used
- measuring current using a clip-on (tong tester) taking each circuit conductor in turn.

KS02-EP015A Disconnect and Reconnect Motors

Evidence shall show an understanding of disconnect and reconnect motors to an extent indicated by the following aspects

T1 Cable connections encompassing:

- construction of typical power cables.
- principle of operation of the following types of terminals stud, screw, tunnel, faston and soldered
- cable preparation and terminating methods appropriate to each type of terminal, including any special requirements which apply
- terminating cables using all of the above terminal types employing the correct preparation and the relevant terminating tools including the correct size soldering equipment

T2 Protection for Safety encompassing:

- dangers associated with earth-faults.
- protection of persons against electric shock from earth-faults.
- maintaining a low earth-fault current path resistance.
- components in an earth-fault current path.
- testing the resistance of a fault-current path.
- regulatory issues/requirements/limitations in regards to working live

T3 Safety testing preparation and procedures encompassing:

- faulty earth-fault current paths
- using safe working practices when carrying out fault finding work.

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REQUIRED SKILLS AND KNOWLEDGE

- Identification of earthing system components.
- unsatisfactory resistance of a fault-current path.
- actions to rectify unsatisfactory resistance of an earth-fault current path or insulation.

T4 Isolating supplies encompassing:

- regulatory requirements in regards to working de-energised, and ensuring and maintaining isolation
- reasons for advising all personnel likely to be affected:
- preventing others wanting to remake supply
- reason for isolation and approximate time of outage to allow planning of alternate activities
- identification the type and arrangement of circuits supplying equipment that is to be disconnected
- availability of supply is tested at an motor about to be disconnected
- locating isolation device/s e.g. lockable adjacent isolating switch or fuse/circuit breaker at a distribution board usually identified at the motor.
- determining the method of isolation to be used; which available device
- isolating a supply at a fuse, the fuse wedge is removed only after the motor is turned off and why the empty wedge is replaced once the fusible link has been removed
- tests to determine if an motor is turned off when isolating at a fuse/circuit breaker
- use of and reason for danger tags at the point of isolation
- reason for the following steps: testing on a known live supply, testing for isolation, retesting on a known live supply after confirming isolation

T5 Disconnecting an motor - ELV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a ELV single phase and/or multiphase supply of voltages up to 50 V a.c. or 120 V d.c.
- procedures that ensure the safe isolation of the supply to motor which is to be disconnected.
- disconnecting isolated electrical motor from fixed wiring with minimal damage to wiring system. after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T6 Reconnecting an motor- ELV encompassing:

- importance of checking the new electrical motor nameplate details against those of the motor being replaced
- need for high insulation resistance and the need to test insulation of 400 volt motor at 1000 volts and identify the minimum acceptable value of insulation resistance between active.
- testing procedures: testing on a known live supply, testing for isolation and

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REQUIRED SKILLS AND KNOWLEDGE

retesting on a known live supply after confirming isolation

- need to disconnect circuit cables before undertaking insulation resistance testing
- compliance testing the motor: insulation resistance test and continuity test
- need to ensure the following steps are taken when terminating cables: stranded conductors are twisted tightly together, appropriate lugs are used rather than simple loops under a nut e.g. soldered lugs or Ross Courtney, Stanco or other solderless variety, shake proof washers are used, cables are not left under physical stress, cables are protected when passing through metal openings, conductors are doubled in tunnel connectors

T7 Disconnecting an motor- LV encompassing:

- identification of the type and arrangement of circuits supplying equipment that is to be disconnected from a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures that ensure the safe isolation of the supply to equipment which is to be disconnected
- disconnection of isolated equipment from fixed wiring with minimal damage to wiring system after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T8 Reconnecting an motor– LV encompassing:

- importance of checking the new motor nameplate details against those of the electrical motor being replaced
- need to visually inspect and test the motor electrical characteristics using suitable test equipment to ensure equipment is safe to connect in regard to sufficiently high insulation resistance, arrangements for protection against indirect contact are undamaged and in place, appropriate IP rating, and arrangements for protection against dangers of mechanical movement are undamaged and in place
- compliance testing of the motor, ie insulation resistance and continuity
- testing the disconnected motor for faults (open circuits, partial open circuits, short circuits, partial short circuits and earth faults), and recognise any unsatisfactory test results obtained
- procedures for equipment with unsatisfactory results - unsuitability for reconnection
- identification of the type and arrangement of circuits supplying equipment that is to be reconnected to a single phase and/or multiphase supply of voltages up to 1000 V a.c. or 1500 V d.c.
- procedures ensuring isolation of supply
- process to establish the integrity of the circuit to which the disconnected equipment is to be connected, including:
- testing the resistance between the protective earthing conductor and neutral conductor as applicable is sufficiently low ie not greater than 2 ohms
- insulation resistance of the active conductors is greater than 1 megohm

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REQUIRED SKILLS AND KNOWLEDGE

- engaging appropriately qualified person to rectify any noncompliance
- appropriate cable termination practices
- reconnection of motor to fixed wiring with minimal damage to wiring system
- continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure
- restoring supply after ensuring correct connections, and all safety requirements have been met
- testing the supply at water heater
- restoring all mechanical protection eg terminal covers
- checking operation of reconnected equipment

T9 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads.
- production of reports and documents to use a suitable procedure to safely disconnect a component from a single phase supply and/or multiphase supply.
- content required in reports and documents used to safely determine the suitability of a component for reconnection to supply.
- producing reports and documents for the safe reconnection/commissioning of a component to the supply.

T10 Enterprise reporting and recording system encompassing:

- purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records for regulation requirements
- producing enterprise records and documents for the safe reconnection/commissioning of a component to the supply.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Disconnect and reconnect fixed wired motors connected to a Low Voltage supply as described in 8) for each endorsement and including:

    a. OHS practice

    b. Determining electrical characteristics of motors

    c. Selecting tools, equipment, and testing devices

    d. Identifying point of installation

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e. Identifying and isolating circuit (including testing for safe isolation)
f. Preparing to disconnect motors
g. Undertaking visual checks of the motors and associated wiring to detect and reporting any abnormal or obvious damage or fault
h. Disconnecting of motors
i. Preparing to reconnect motors
j. Reconnection of motors
k. Testing of the reconnected motors for safe operation including polarity and earth continuity
l. Identifying fault(s) at point of disconnection and/or reconnection in accordance with established procedures
m. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment,

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conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to disconnecting and reconnecting fixed wired motors connected to a Low Voltage supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Competency shall be demonstrated in relation to disconnecting and reconnecting motors connected to supplies up to 1,000V a.c or 1,500V d.c:

Note:

Limitations of this unit. This unit does not cover installations

a. where high fault currents are possible,
b. comprised of complex electrical apparatus and circuits,
c. associated with fixed wiring including locating and rectifying faults of circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work),
d. which are luminaries,
e. in hazardous areas or on electrical equipment that is part of an explosion-protection technique.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836:2001 ‘Safe working on low-voltage electrical installations.’

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP016A Locate and rectify faults in low voltage appliances using set procedures

Modification History

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers locating and rectifying fault(s) in appliances intended to operate to a connected supply up to 1,000 volts a.c. or 1,500 volts d.c. This may be incidental to or a primary and regular function in the workplace. It encompasses following prescribed procedures, working safely, reading circuit diagrams, isolation procedures, identifying faults according to procedures, identifying like for like replacement/repair components according to procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safety testing and reporting.

Note: Limitations of this unit.

This unit does not cover installations:

a. Where high fault currents are possible,
b. Comprised of complex electrical apparatus and circuits,
c. Associated with fixed wiring other than disconnecting and reconnecting electrical appliance, circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).listed in the Range Statement of the unit,
d. In hazardous areas or on electrical appliance that is part of an explosion protection technique.

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Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP010A	Disconnect / reconnect appliances connected to low voltage installation wiring

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to identify fault(s)	1.1	Nature of the fault(s) is confirmed in accordance with established procedures and appropriate personnel.
	1.2	The work is planned to ensure OHS policies and established procedures are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Tools, appliance and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	Possible electrical appliance fault(s) are checked against job requirements and in accordance with established procedures.
	1.6	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
	1.7	Electrical characteristics of electrical appliance and electrical supply are determined and recorded in accordance with established procedures.
	1.8	Electrical appliance and associated circuits are identified for isolation purposes, where necessary, in accordance with established procedures.
2 Locate fault(s) in the electrical appliance	2.1	Electrical appliance and associated circuits are isolated, where necessary, in accordance with established procedures.
	2.2	Other OHS policies and procedures are followed.
	2.3	Visual checks of the electrical appliance and components are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	2.4	Safety tests and circuit continuity are progressively carried out to assure isolation, and to detect operational, electrical or other non-conformances or fault(s).
	2.5	Electrical appliance is dismantled and/or removed, where necessary, and components stored in accordance with established procedures

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ELEMENT	PERFORMANCE CRITERIA	
		to protect them against loss or damage.
	2.6	Fault(s) are confirmed and components to be replaced or adjusted are determined and details recorded in accordance with established procedures.
	2.7	Ongoing checks of the quality of work are undertaken in accordance with established procedures.
3 Rectify fault(s)	3.1	Isolation of electrical appliance and associated circuits is confirmed in accordance with requirements and established procedures.
	3.2	Materials and resources necessary to complete the work are obtained in accordance with established procedures and checked against job requirements.
	3.3	Adjustments are made in accordance with established procedures, where necessary, to ensure electrical appliance operates in accordance with intended parameters.
	3.4	Fault(s) are rectified in accordance with established procedures, where necessary.
	3.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	3.6	Tests on the electrical appliance are in accordance with established procedures performed to ensure safe return to service and operation of the electrical appliance.
4 Provide status report(s)	4.1	Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and locate and rectify faults in electrical low voltage appliance following prescribed procedures.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP017A/016A? Fault find – electrical appliances

Evidence shall show an understanding of fault finding electrical appliances to an extent indicated by the following aspects

T1 Safe fault finding encompassing:

- using safe working practices when carrying out fault finding
- identification of common types of electrical faults (open circuit, short circuit, partial open circuit and partial short circuit)
- symptoms of common faults (human body senses – hearing, smell, sight and touch, electrical measurement – resistance, current and voltage)
- using appropriate test equipment to locate common faults

T2 Single phase appliances encompassing:

- appliances
- types of single and three phase appliances
- basic principles of operation of typical appliances
- identification of basic types of single/three phase appliances
- interpretation of ratings from nameplates for comparison with any replacement
- principles of operation of control equipment and protection devices associated with a range of single/three phase appliances
- common faults that occur in single phase appliances and the indicators of such faults
- techniques to ensure the electrical isolation and the maintenance of electrical isolation of single/three phase appliances when conducting fault finding on it
- regulatory requirements/obligations in regard to any “live” testing that may be unavoidable
- fault finding procedures
- visual checking techniques on a range of single/three phase appliances
- using test instrumentation, safely conduct procedures to identify faults in a range of single/three phase appliances
- rectification all identified faults ensuring appropriate consultation/approval before implementing contingencies

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REQUIRED SKILLS AND KNOWLEDGE

- testing required to ensure repaired equipment is safe for connection to supply
- checking repaired equipment for safe and correct operation

T3 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads
- production of reports and documents to use a suitable procedure to safely locate and rectify faults in electrical low voltage appliances following prescribed procedures
- content required in reports and documents used to safely locate and rectify faults in electrical low voltage composite appliances following prescribed procedures
- producing reports and documents for the safe location and rectification of faults in electrical low voltage appliances following prescribed procedures

T4 Enterprise reporting and recording systems encompassing:

- state the purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records required by regulation requirements
- producing enterprise records and documents for the safe location and rectification of faults in electrical low voltage appliances following prescribed procedures

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best

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utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical appliance, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline,

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work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Locate and rectify faults in low voltage electrical appliances following prescribed procedures as described in 8) and including:

  a. Following safe work practices and procedures
  b. Identification, testing and isolation of electrical appliance according to requirements
  c. Preparing to locate faults and repairing electrical appliance according to requirement/procedures
  d. Using routine fault finding techniques and procedures
  e. Identifying and locating fault(s) in accordance with requirements
  f. Preparation to replace like for like, implementing routine repairs and reconnecting electrical appliance as per procedures
  g. Rectifying electrical appliance fault(s) in accordance with requirements
  h. Returning to service and testing for polarity, continuity and insulation resistance in accordance with requirements/procedures
  i. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to

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contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, appliance and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to locating and rectifying faults in electrical low voltage appliance following prescribed procedures.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary appliance and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit

UEENEEP010A Disconnect / reconnect appliances connected to low voltage installation wiring

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to locating and rectifying faults in electrical appliance intended to operate from fixed wired supply up to 1,000 V a.c or 1,500 V d.c.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836:2001 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit	N/A	Add wording "three" to "single/three phase" in EKAS outline	N/A
4	Edit		Change the font of "*UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring* "	

Unit Descriptor

Unit Descriptor

1)

1.1) **Descriptor**

This unit covers locating and rectifying fault(s) in composite appliances intended to operate to a connected supply up to 1,000 volts a.c. or 1,500 volts d.c. This may be incidental to or a primary and regular function in the workplace. It encompasses following prescribed procedures, working safely, reading circuit diagrams, isolation procedures, identifying faults according to procedures, identifying like for like replacement/repair components according to procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safety testing and reporting.

Note: Limitations of this unit.

This unit does **not** cover installations:

a) Where high fault currents are possible,

b) Comprised of complex electrical apparatus and circuits,

c) Associated with fixed wiring other than disconnecting and reconnecting electrical equipment, circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit

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Unit Descriptor **1**)

1.1) **Descriptor**

protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).listed in the Range Statement of the unit,

d) In hazardous areas or on electrical equipment that is part of an explosion protection technique.

Application of the Unit

Application of the Unit **4**)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

1.2) **License to practice**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

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Prerequisite Unit(s) **2)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring

Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to identify fault(s)	1.1	Nature of the fault(s) is confirmed in accordance with established procedures and appropriate personnel.
	1.2	The work is planned to ensure OHS policies and established procedures are followed.
	1.3	Tools, equipment and testing devices needed to

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ELEMENT	PERFORMANCE CRITERIA	
		carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	Possible electrical composite equipment fault(s) are checked against job requirements and in accordance with established procedures.
	1.6	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
	1.7	Electrical characteristics of electrical composite equipment and electrical supply are determined and recorded in accordance with established procedures.
	1.8	Electrical composite equipment and associated circuits are identified for isolation purposes, where necessary, in accordance with established procedures.
2 Locate fault(s) in the electrical composite equipment.	2.1	Electrical composite equipment and associated circuits are isolated, where necessary, in accordance with established procedures.
	2.2	Other OHS policies and procedures are followed.
	2.3	Visual checks of the electrical composite equipment and components are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	2.4	Safety tests and circuit continuity are progressively carried out to assure isolation, and to detect operational, electrical or other non-conformances or fault(s).
	2.5	Electrical composite equipment is dismantled and/or removed, where necessary, and components stored in accordance with established procedures to protect them against

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ELEMENT	PERFORMANCE CRITERIA	
		loss or damage.
	2.6	Fault(s) are confirmed and components to be replaced or adjusted are determined and details recorded in accordance with established procedures.
	2.7	Ongoing checks of the quality of work are undertaken in accordance with established procedures.
3 Rectify fault(s).	3.1	Isolation of electrical composite equipment and associated circuits is confirmed in accordance with requirements and established procedures.
	3.2	Materials and resources necessary to complete the work are obtained in accordance with established procedures and checked against job requirements.
	3.3	Adjustments are made in accordance with established procedures, where necessary, to ensure electrical composite equipment operates in accordance with intended parameters.
	3.4	Fault(s) are rectified in accordance with established procedures, where necessary.
	3.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	3.6	Tests on the electrical composite equipment are in accordance with established procedures performed to ensure safe return to service and operation of the electrical composite equipment.
4 Provide status report(s).	4.1	Status report(s) are completed and notified in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and locate and rectify faults in electrical low voltage composite equipment following prescribed procedures.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP017A Fault find – electrical composite appliances/ Fault find – electrical composite equipment?

Evidence shall show an understanding of fault finding electrical composite equipment to an extent indicated by the following aspects

T1 Safe fault finding encompassing:

- using safe working practices when carrying out fault finding
- identification of common types of electrical faults (open circuit, short circuit, partial open circuit and partial short circuit)
- symptoms of common faults (human body senses – hearing, smell, sight and touch, electrical measurement – resistance, current and voltage)
- using appropriate test equipment to locate common faults

T2 Single and three phase composite equipment encompassing:

- composite equipment
- types of single and three phase composite equipment
- basic principles of operation of typical composite equipment
- identification of basic types of single/three phase composite equipment
- interpretation of ratings from nameplates for comparison with any replacement
- principles of operation of control equipment and protection devices associated with a range of single/three phase composite equipment
- common faults that occur in single/three phase composite equipment and the indicators of such faults
- techniques to ensure the electrical isolation and the maintenance of electrical isolation of single/three phase composite equipment when conducting fault finding on it
- regulatory requirements/obligations in regard to any “live” testing that may be unavoidable
- fault finding procedures
- visual checking techniques on a range of single/three phase composite equipment
- using test instrumentation, safely conduct procedures to identify faults in a range of single/three phase composite equipment
- rectification all identified faults ensuring appropriate consultation/approval before implementing contingencies

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REQUIRED SKILLS AND KNOWLEDGE

- testing required to ensure repaired equipment is safe for connection to supply
- checking repaired equipment for safe and correct operation

T3 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads
- production of reports and documents to use a suitable procedure to safely locate and rectify faults in electrical low voltage composite equipment following prescribed procedures
- content required in reports and documents used to safely locate and rectify faults in electrical low voltage composite equipment following prescribed procedures
- producing reports and documents for the safe location and rectification of faults in electrical low voltage composite equipment following prescribed procedures
- T4 Enterprise reporting and recording systems encompassing:
- state the purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records required by regulation requirements
- producing enterprise records and documents for the safe location and rectification of faults in electrical low voltage composite equipment following prescribed procedures

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum,

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EVIDENCE GUIDE

the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Locate and rectify faults in electrical low voltage equipment following prescribed procedures as described in 8) for each endorsement and including:

    A Following safe work practices and procedures

    B Identification, testing and isolation of electrical composite equipment according to requirements

    C Preparing to locate faults and repairing electrical composite equipment according to requirement/procedures

    D Using routine fault finding techniques and procedures

    E Identifying and locating fault(s) in accordance with requirements

    F Preparation to replace like for like, implementing routine repairs and reconnecting electrical composite equipment as per procedures

    G Rectifying electrical composite equipment fault(s) in accordance with requirements

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H Returning to service and testing for polarity, continuity and insulation resistance in accordance with requirements/procedures

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.**3**)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to locating and rectifying faults in electrical low voltage equipment following prescribed procedures.

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Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit *UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring*

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to locating and rectifying faults in electrical composite equipment intended to operate from fixed wired supply up to 1,000 V a.c or 1,500 V d.c.

Examples of electrical composite equipment are; self-contained refrigeration units, machine tools, and modular telephone booths.

.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836:2001 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Custom Content Section

2.2) Literacy and numeracy skills

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Competency Field

Competency Field **5**)

Restricted and Specialisations

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UEENEEP018A Locate and rectify faults in low voltage control devices using set procedures

Modification History

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers locating and rectifying fault(s) in control devices intended to operate to a connected supply up to 1,000 volts a.c. or 1,500 volts d.c. This may be incidental to or a primary and regular function in the workplace. It encompasses following prescribed procedures, working safely, reading circuit diagrams, isolation procedures, identifying faults according to procedures, identifying like for like replacement/repair components according to procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safety testing and reporting.

Note: Limitations of this unit.

This unit does **not** cover installations:

a) Where high fault currents are possible,

b) Comprised of complex electrical apparatus and circuits,

c) Associated with fixed wiring other than disconnecting and reconnecting electrical appliance, circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).listed in the Range Statement of the unit,

d) In hazardous areas or on electrical appliance that is part of an explosion protection technique.

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Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP013A	Disconnect / reconnect control devices connected to low voltage installation

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Prerequisite Unit(s) **4)**

wiring

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to identify fault(s)	1.1	Nature of the fault(s) is confirmed in accordance with established procedures and appropriate personnel.
	1.2	The work is planned to ensure OHS policies and established procedures are followed.
	1.3	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	Possible control devices fault(s) are checked against job requirements and in accordance with established procedures.
	1.6	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
	1.7	Electrical characteristics of control devices and electrical supply are determined and recorded in accordance with established procedures.
	1.8	Control devices and associated circuits are identified for isolation purposes, where necessary, in accordance with established procedures.
2 Locate fault(s) in the control devices	2.1	Control devices and associated circuits are isolated, where necessary, in accordance with established procedures.
	2.2	Other OHS policies and procedures are followed.
	2.3	Visual checks of the control devices and components are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Safety tests and circuit continuity are progressively carried out to assure isolation, and to detect operational, electrical or other non-conformances or fault(s).
	2.5	Control devices are dismantled and/or removed, where necessary, and components stored in accordance with established procedures to protect them against loss or damage.
	2.6	Fault(s) are confirmed and components to be replaced or adjusted are determined and details recorded in accordance with established procedures.
	2.7	Ongoing checks of the quality of work are undertaken in accordance with established procedures.
3 Rectify fault(s)	3.1	Isolation of control devices and associated circuits is confirmed in accordance with requirements and established procedures.
	3.2	Materials and resources necessary to complete the work are obtained in accordance with established procedures and checked against job requirements.
	3.3	Adjustments are made in accordance with established procedures, where necessary, to ensure control devices operates in accordance with intended parameters.
	3.4	Fault(s) are rectified in accordance with established procedures, where necessary.
	3.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	3.6	Tests on the control devices are in accordance with established procedures performed to ensure safe return to service and operation of the control devices.

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ELEMENT	PERFORMANCE CRITERIA
4 Provide status report(s)	4.1 Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and locate and rectify faults in electrical low voltage appliance following prescribed procedures.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP018A **Fault find – control devices**

Evidence shall show an understanding of fault finding control devices to an extent indicated by the following aspects

T9 Safe fault finding encompassing:

- using safe working practices when carrying out fault finding
- identification of common types of electrical faults (open circuit, short circuit, partial open circuit and partial short circuit)
- symptoms of common faults (human body senses – hearing, smell, sight and touch, electrical measurement – resistance, current and voltage)
- using appropriate test equipment to locate common faults

T10 Single phase control devices encompassing:

- control devices
- types of single and three phase control devices
- basic principles of operation of typical control devices
- identification of basic types of single/three phase control devices
- interpretation of ratings from nameplates for comparison with any replacement
- principles of operation of control equipment and protection devices associated with a range of single/three phase control devices
- common faults that occur in single phase control devices and the indicators of such faults
- techniques to ensure the electrical isolation and the maintenance of electrical isolation of single/three phase control devices when conducting fault finding on it
- regulatory requirements/obligations in regard to any “live” testing that may be unavoidable
- fault finding procedures
- visual checking techniques on a range of single/three phase control devices
- using test instrumentation, safely conduct procedures to identify faults in a range of single/three phase control devices
- rectification all identified faults ensuring appropriate consultation/approval before implementing contingencies

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REQUIRED SKILLS AND KNOWLEDGE

- testing required to ensure repaired equipment is safe for connection to supply
- checking repaired equipment for safe and correct operation

T11 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads
- production of reports and documents to use a suitable procedure to safely locate and rectify faults in electrical low voltage control devices following prescribed procedures
- content required in reports and documents used to safely locate and rectify faults in electrical low voltage control devices following prescribed procedures
- producing reports and documents for the safe location and rectification of faults in electrical low voltage control devices following prescribed procedures

T12 Enterprise reporting and recording systems encompassing:

- state the purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records required by regulation requirements

producing enterprise records and documents for the safe location and rectification of faults in electrical low voltage control devices following prescribed procedures

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment

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intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical appliance, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Locate and rectify faults in low voltage control devices following prescribed procedures as described in 8) and including:

  a. Following safe work practices and procedures
  b. Identification, testing and isolation of control devices according to requirements
  c. Preparing to locate faults and repairing control devices according to requirement/procedures
  d. Using routine fault finding techniques and procedures
  e. Identifying and locating fault(s) in accordance with requirements
  f. Preparation to replace like for like, implementing routine repairs and reconnecting control devices as per procedures
  g. Rectifying control devices fault(s) in accordance with requirements
  h. Returning to service and testing for polarity, continuity and insulation resistance in accordance with requirements/procedures
  i. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with

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performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, appliance and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to locating and rectifying faults in low voltage control devices following prescribed procedures.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary appliance and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit

UEENEEP013A Disconnect / reconnect control devices connected to low voltage installation wiring

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to locating and rectifying faults in control devices intended to operate from fixed wired supply up to 1,000 V a.c or 1,500 V d.c.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836:2001 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP019A Locate and rectify faults in low voltage water heaters using set procedures

Modification History

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers locating and rectifying fault(s) in water heaters intended to operate to a connected supply up to 1,000 volts a.c. or 1,500 volts d.c. This may be incidental to or a primary and regular function in the workplace. It encompasses following prescribed procedures, working safely, reading circuit diagrams, isolation procedures, identifying faults according to procedures, identifying like for like replacement/repair components according to procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safety testing and reporting.

Note: Limitations of this unit.

This unit does not cover installations:

a) Where high fault currents are possible,

b) Comprised of complex electrical apparatus and circuits,

c) Associated with fixed wiring other than disconnecting and reconnecting electrical appliance, circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc.); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).listed in the Range Statement of the unit,

d) In hazardous areas or on electrical appliance that is part of an explosion protection technique.

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Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP014A	Disconnect / reconnect water heaters connected to low voltage installation

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Prerequisite Unit(s) **4)**

wiring

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to identify fault(s)	1.1	Nature of the fault(s) is confirmed in accordance with established procedures and appropriate personnel.
	1.2	The work is planned to ensure OHS policies and established procedures are followed.
	1.3	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	Possible water heaters fault(s) are checked against job requirements and in accordance with established procedures.
	1.6	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
	1.7	Electrical characteristics of water heaters and electrical supply are determined and recorded in accordance with established procedures.
	1.8	Water heaters and associated circuits are identified for isolation purposes, where necessary, in accordance with established procedures.
2 Locate fault(s) in the water heaters	2.1	Water heaters and associated circuits are isolated, where necessary, in accordance with established procedures.
	2.2	Other OHS policies and procedures are followed.
	2.3	Visual checks of the water heaters and components are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Safety tests and circuit continuity are progressively carried out to assure isolation, and to detect operational, electrical or other non-conformances or fault(s).
	2.5	Water heaters are dismantled and/or removed, where necessary, and components stored in accordance with established procedures to protect them against loss or damage.
	2.6	Fault(s) are confirmed and components to be replaced or adjusted are determined and details recorded in accordance with established procedures.
	2.7	Ongoing checks of the quality of work are undertaken in accordance with established procedures.
3 Rectify fault(s)	3.1	Isolation of water heaters and associated circuits is confirmed in accordance with requirements and established procedures.
	3.2	Materials and resources necessary to complete the work are obtained in accordance with established procedures and checked against job requirements.
	3.3	Adjustments are made in accordance with established procedures, where necessary, to ensure water heaters operates in accordance with intended parameters.
	3.4	Fault(s) are rectified in accordance with established procedures, where necessary.
	3.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	3.6	Tests on the water heaters are in accordance with established procedures performed to ensure safe return to service and operation of the water heaters.

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ELEMENT	PERFORMANCE CRITERIA
4 Provide status report(s)	4.1 Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and locate and rectify faults in electrical low voltage appliance following prescribed procedures.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP019A **Fault find – water heaters**

Evidence shall show an understanding of fault finding water heaters to an extent indicated by the following aspects

T13 Safe fault finding encompassing:

- using safe working practices when carrying out fault finding
- identification of common types of electrical faults (open circuit, short circuit, partial open circuit and partial short circuit)
- symptoms of common faults (human body senses – hearing, smell, sight and touch, electrical measurement – resistance, current and voltage)
- using appropriate test equipment to locate common faults

T14 Single/three phase water heaters encompassing:

- water heaters
- types of single and three phase water heaters
- basic principles of operation of typical water heaters
- identification of basic types of single/three phase water heaters
- interpretation of ratings from nameplates for comparison with any replacement
- principles of operation of control equipment and protection devices associated with a range of single/three phase water heaters
- common faults that occur in single phase water heaters and the indicators of such faults
- techniques to ensure the electrical isolation and the maintenance of electrical isolation of single/three phase water heaters when conducting fault finding on it
- regulatory requirements/obligations in regard to any “live” testing that may be unavoidable
- fault finding procedures
- visual checking techniques on a range of single/three phase water heaters
- using test instrumentation, safely conduct procedures to identify faults in a range of single/three phase water heaters
- rectification all identified faults ensuring appropriate consultation/approval before implementing contingencies

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REQUIRED SKILLS AND KNOWLEDGE

- testing required to ensure repaired equipment is safe for connection to supply
- checking repaired equipment for safe and correct operation

T15 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads
- production of reports and documents to use a suitable procedure to safely locate and rectify faults in electrical low voltage water heaters following prescribed procedures
- content required in reports and documents used to safely locate and rectify faults in electrical low voltage water heaters following prescribed procedures
- producing reports and documents for the safe location and rectification of faults in electrical low voltage water heaters following prescribed procedures

T16 Enterprise reporting and recording systems encompassing:

- state the purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records required by regulation requirements
- producing enterprise records and documents for the safe location and rectification of faults in electrical low voltage water heaters following prescribed procedures

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best

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utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical appliance, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline,

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work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Locate and rectify faults in low voltage water heaters following prescribed procedures as described in 8) and including:

  a. Following safe work practices and procedures
  b. Identification, testing and isolation of water heaters according to requirements
  c. Preparing to locate faults and repairing water heaters according to requirement/procedures
  d. Using routine fault finding techniques and procedures
  e. Identifying and locating fault(s) in accordance with requirements
  f. Preparation to replace like for like, implementing routine repairs and reconnecting water heaters as per procedures
  g. Rectifying water heaters fault(s) in accordance with requirements
  h. Returning to service and testing for polarity, continuity and insulation resistance in accordance with requirements/procedures
  i. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these

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cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, appliance and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to locating and rectifying faults in low voltage water heaters following prescribed procedures.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary appliance and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit

UEENEEP014A Disconnect / reconnect water heaters connected to low voltage installation wiring

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to locating and rectifying faults in water heaters intended to operate from fixed wired supply up to 1,000 V a.c or 1,500 V d.c.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836:2001 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP020A Locate and rectify faults in low voltage motors using set procedures

Modification History

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers locating and rectifying fault(s) in motors intended to operate to a connected supply up to 1,000 volts a.c. or 1,500 volts d.c. This may be incidental to or a primary and regular function in the workplace. It encompasses following prescribed procedures, working safely, reading circuit diagrams, isolation procedures, identifying faults according to procedures, identifying like for like replacement/repair components according to procedures, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safety testing and reporting.

Note: Limitations of this unit.

This unit does not cover installations:

a) Where high fault currents are possible,

b) Comprised of complex electrical apparatus and circuits,

c) Associated with fixed wiring other than disconnecting and reconnecting electrical appliance, circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work).listed in the Range Statement of the unit,

d) In hazardous areas or on electrical appliance that is part of an explosion protection technique.

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Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP015A	Disconnect / reconnect motors connected to low voltage installation wiring

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Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to identify fault(s)	1.1	Nature of the fault(s) is confirmed in accordance with established procedures and appropriate personnel.
	1.2	The work is planned to ensure OHS policies and established procedures are followed.

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ELEMENT	PERFORMANCE CRITERIA	
	1.3	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
	1.4	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.5	Possible motors fault(s) are checked against job requirements and in accordance with established procedures.
	1.6	Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements.
	1.7	Electrical characteristics of motors and electrical supply are determined and recorded in accordance with established procedures.
	1.8	Motors and associated circuits are identified for isolation purposes, where necessary, in accordance with established procedures.
2 Locate fault(s) in the motors	2.1	Motors and associated circuits are isolated, where necessary, in accordance with established procedures.
	2.2	Other OHS policies and procedures are followed.
	2.3	Visual checks of the motors and components are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	2.4	Safety tests and circuit continuity are progressively carried out to assure isolation, and to detect operational, electrical or other non-conformances or fault(s).
	2.5	Motors are dismantled and/or removed, where necessary, and components stored in accordance with established procedures to protect them against loss or damage.

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ELEMENT	PERFORMANCE CRITERIA	
	2.6	Fault(s) are confirmed and components to be replaced or adjusted are determined and details recorded in accordance with established procedures.
	2.7	Ongoing checks of the quality of work are undertaken in accordance with established procedures.
3 Rectify fault(s)	3.1	Isolation of motors and associated circuits is confirmed in accordance with requirements and established procedures.
	3.2	Materials and resources necessary to complete the work are obtained in accordance with established procedures and checked against job requirements.
	3.3	Adjustments are made in accordance with established procedures, where necessary, to ensure motors operates in accordance with intended parameters.
	3.4	Fault(s) are rectified in accordance with established procedures, where necessary.
	3.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	3.6	Tests on the motors are in accordance with established procedures performed to ensure safe return to service and operation of the motors.
4	4.1	Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and locate and rectify faults in electrical low voltage motors following prescribed procedures.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP020A **Fault find – motors**

Evidence shall show an understanding of fault finding motors to an extent indicated by the following aspects

T17 Safe fault finding encompassing:

- using safe working practices when carrying out fault finding
- identification of common types of electrical faults (open circuit, short circuit, partial open circuit and partial short circuit)
- symptoms of common faults (human body senses – hearing, smell, sight and touch, electrical measurement – resistance, current and voltage)
- using appropriate test equipment to locate common faults

T18 Single/three phase motors encompassing:

- motors
- types of single and three phase motors
- basic principles of operation of typical motors
- identification of basic types of single/three phase motors
- interpretation of ratings from nameplates for comparison with any replacement
- principles of operation of control equipment and protection devices associated with a range of single/three phase motors
- common faults that occur in single/three phase motors and the indicators of such faults
- techniques to ensure the electrical isolation and the maintenance of electrical isolation of single/three phase motors when conducting fault finding on it
- regulatory requirements/obligations in regard to any “live” testing that may be unavoidable
- fault finding procedures
- visual checking techniques on a range of single/three phase motors
- using test instrumentation, safely conduct procedures to identify faults in a range of single/three phase motors
- rectification all identified faults ensuring appropriate consultation/approval before implementing contingencies

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REQUIRED SKILLS AND KNOWLEDGE

- testing required to ensure repaired equipment is safe for connection to supply
- checking repaired equipment for safe and correct operation

T19 Produce documentation and reports encompassing:

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads
- production of reports and documents to use a suitable procedure to safely locate and rectify faults in electrical low voltage motors following prescribed procedures
- content required in reports and documents used to safely locate and rectify faults in electrical low voltage motors following prescribed procedures
- producing reports and documents for the safe location and rectification of faults in electrical low voltage motors following prescribed procedures

T20 Enterprise reporting and recording systems encompassing:

- state the purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records required by regulation requirements
- producing enterprise records and documents for the safe location and rectification of faults in electrical low voltage motors following prescribed procedures

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment

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intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical appliance, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Locate and rectify faults in low voltage motors following prescribed procedures as described in 8) and including:

  a. Following safe work practices and procedures
  b. Identification, testing and isolation of motors according to requirements
  c. Preparing to locate faults and repairing motors according to requirement/procedures
  d. Using routine fault finding techniques and procedures
  e. Identifying and locating fault(s) in accordance with requirements
  f. Preparation to replace like for like, implementing routine repairs and reconnecting motors as per procedures
  g. Rectifying motors fault(s) in accordance with requirements
  h. Returning to service and testing for polarity, continuity and insulation resistance in accordance with requirements/procedures
  i. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be

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clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, appliance and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to locating and rectifying faults in low voltage motors following prescribed procedures.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary appliance and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit

UEENEEP015A Disconnect / reconnect motors connected to low voltage installation wiring

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to locating and rectifying faults in motors intended to operate from fixed wired supply up to 1,000 V a.c or 1,500 V d.c.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP021A Disconnect - reconnect explosion-protected appliances and control devices connected to low voltage installation wiring

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers disconnecting and reconnecting flame proof, increased safety and intrinsic safety electrical equipment to supply up to 1,000V a.c. or 1,500V d.c. under restrictions of designated electrical equipment and conditions specified. It encompasses working safely in hazardous area, identifying supply arrangements, following isolation procedures, handling explosion-protection equipment, selecting and using testing and measuring devices, terminating and connecting cables and conductors, safety testing and reporting.

This unit is directly equivalent to the Unit 2.27 Disconnect and reconnect explosion-protected equipment connected to low voltage supply in the Australian/New Zealand Standard AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

Application of the Unit

Application of the Unit

2)

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

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Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit requires a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace;

and

UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring;

OR

UEENEEP013A	Disconnect /reconnect electrical equipment connected to low voltage installation wiring

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Prerequisite Unit(s) **4)**

Competencies needed for emergency services and equipment repair.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to disconnect electrical equipment	1.1	Disconnection is planned to ensure OHS policies and procedures are followed.
	1.2	Appropriate persons are consulted to ensure work is coordinated effectively with others involved in the work site.
	1.3	Safety hazards which have not previously been electrical characteristics of electrical equipment and electrical supply are determined and recorded in accordance with established procedures.
	1.4	The point of isolation of electrical equipment to be disconnected is determined.
	1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Disconnect electrical equipment	2.1	OHS policies and procedures are followed.
	2.2	Electrical equipment is isolated in accordance with AS/NZS 4836 and established procedures (see Range Statement).
	2.3	Conductor connection sequence is recorded and labelled in accordance with established procedures.
	2.4	Visual checks of the electrical equipment and associated wiring are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	2.5	Isolated equipment is confirmed as de-energised.
	2.6	Electrical equipment is disconnected from fixed wiring without damage to other components.
	2.7	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are

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ELEMENT	PERFORMANCE CRITERIA	
		implemented.
	2.8	Disconnected conductors/cables are terminated in accordance with requirements to ensure they are safe and present no potential hazard.
3 Prepare to reconnect electrical equipment	3.1	Reconnection is planned to ensure OHS policies and procedures are followed.
	3.2	Appropriate personnel are consulted to ensure work is coordinated effectively with others involved in the work site.
	3.3	The point of isolation of the circuit to which the electrical equipment is to be connected is determined.
	3.4	Replacement electrical equipment is selected on the basis of rating and characteristics being the same as that of the original electrical equipment.
	3.5	Appropriate personnel are consulted in the event that replacement electrical equipment are not available.
	3.6	Original and/or replacement electrical equipment is tested to ensure it is safe to connect to the electrical supply and use.
	3.7	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
4 Reconnect electrical equipment	4.1	OHS policies and procedures are followed.
	4.2	Measures are taken to ensure circuit to which electrical equipment is to be connected remains isolated and de-energised in accordance with AS/NZS 4836.
	4.3	The continuity of the protective earthing conductor is tested to determine whether it is sufficiently low.
	4.4	The resistance between the protective earthing conductor and the neutral conductor is tested to

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ELEMENT	PERFORMANCE CRITERIA	
		determine whether it is sufficiently low, i.e. not greater than 2 Ohms.
	4.5	The insulation resistance of active conductors is tested to confirm that it is greater than 1 Megohm.
	4.6	An appropriate qualified person is engaged to rectify any non-compliance condition revealed by the testing under item 4.3 to 4.5.
	4.7	Continuity between exposed conductive parts of the appliance and the main earth or metal switchboard enclosure is confirmed.
	4.8	Electrical equipment is connected to comply with requirements.
	4.9	Connections to the electrical equipment are checked to confirm they are correct.
5 Test the reconnected electrical equipment for safe operation	5.1	OHS policies and procedures, and established procedures for the reinstatement of isolated circuits and electrical equipment are followed.
	5.2	Arrangements are made with appropriate personnel to test the operation of the electrical equipment in accordance with established procedures.
	5.3	Operational non-conformances are identified and reported in accordance with established procedures.
6 Identify and report faults	6.1	Electrical equipment is isolated in accordance with established procedures.
	6.2	Other OHS policies and procedures are followed.
	6.3	Visual checks of the electrical equipment to be disconnected and/or reconnected are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	6.4	Fault(s) at point of disconnection and/or reconnection are identified and reported in

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ELEMENT	PERFORMANCE CRITERIA	
		accordance with established procedures.
	6.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
7 Provide status report(s)	7.1	Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and disconnecting and reconnecting fixed wired explosion-protected electrical equipment connected to a Low Voltage supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP021A Disconnect and Reconnect Explosion-Protected Electrical Equipment

Evidence shall show an understanding of working safely in hazardous areas to an extent indicated by the following aspects:

T1 Hazardous area safe working practices encompassing:

- Occupational Health and Safety responsibilities related to hazardous areas: the main features and purpose of a ‘clearance to work’ (includes hot work permit systems) system;
- Typical safety procedures that should be followed before entering a hazardous area;
- The purpose of gas detectors and their use and limitations
- Effects of temperature on gas and vapour detection; frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise; factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature; safety in use of gas detectors, for example, ‘read and run concept’
- Safety measures to be taken when working in a hazardous area.
- The roles of the parties (include Standard bodies, experienced consultants) involved in the safety of hazardous areas: common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation; where assistance and further information can be obtained to assist persons with hazardous area responsibilities: Persons with hazardous area responsibilities include the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T2 Hazardous area and explosion protection principles encompassing:

- Properties of combustible substances and their potential to create an explosive

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REQUIRED SKILLS AND KNOWLEDGE

hazard: condition in the workplace that will lead to an explosion; the terms ‘combustion’, ‘ignition’ and ‘propagation’; explosive range of substances encountered in the workplace i.e. LEL/UEL; explosive parameters of substances as given in tables of substance properties

- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point, the difference between gases and vapours; and the toxic nature of gases and vapours and potential harmful consequences.
- The nature of hazardous areas: the Standards definition of a ‘hazardous area’; the recommended methods for classifying the type and degree of explosion hazard in an area; hazardous area classifications as defined by Standards; and factors that are considered when a hazardous area is classified.
- The basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.

T3 Explosion-protected techniques — Principles encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works.
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T4 Flameproof (Ex ‘d’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
- Typical situations where the flameproof explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Flameproof technique; and
- The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.

T5 Increased safety (Ex ‘e’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
- Typical situations where the Increased safety explosion-protection technique is

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REQUIRED SKILLS AND KNOWLEDGE

used;

- Actions or conditions that would void the protection provided the Increased safety technique; and
- The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.

T6 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).
- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety; and
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T7 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T8 Hazardous areas cable termination devices and applications encompassing:

- Explosion protection features of cable terminations devices.
- Selecting compliant cable termination devices.

T9 Hazardous areas cable termination techniques encompassing:

- Installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)

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REQUIRED SKILLS AND KNOWLEDGE

- Terminating a cable with a barrier gland. (Gases only.)
- Terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- Testing termination/connections of installed cables/circuits.

T10 Enterprise reporting and recording system encompassing:

- purpose and extent of maintaining work activities records in an enterprise
- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records for regulation requirements
- producing enterprise records and documents for the safe reconnection/commissioning of a component to the supply.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

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various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge

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and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Disconnect and reconnect fixed wired electrical equipment connected to a Low Voltage supply as described in 8) for each endorsement and including:

  a. OHS practice
  b. Determining electrical characteristics of explosion-protected electrical equipment
  c. Selecting tools, equipment, and testing devices
  d. Identifying point of installation
  e. Identifying and isolating circuit (including testing for safe isolation)
  f. Preparing to disconnect explosion-protected electrical equipment
  g. Undertaking visual checks of the explosion-protected electrical equipment and associated wiring to detect and reporting any abnormal or obvious damage or fault
  h. Disconnecting of explosion-protected electrical equipment
  i. Preparing to reconnect explosion-protected electrical equipment
  j. Reconnection of explosion-protected electrical equipment
  k. Testing of the reconnected explosion-protected electrical equipment for safe operation including polarity and earth continuity
  l. Identifying fault(s) at point of disconnection and/or reconnection in accordance with established procedures
  m. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be

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clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to disconnecting and reconnecting fixed wired explosion-protected electrical equipment connected to a Low Voltage supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to a gas hazardous area and disconnecting and reconnecting equipment connected to supplies up to 1,000V a.c or 1,500V d.c which incorporating the following explosion-protection techniques:

- Flame proof (Ex d)
- Increased safety (Ex e)
- Intrinsic safety (Ex ‘i’)

Note:

Limitations of this unit. This unit does not cover installations

a. where high fault currents are possible,
b. comprised of complex electrical apparatus and circuits,
c. associated with fixed wiring including locating and rectifying faults of circuits at a switchboard or to general electrical accessories (including switches, socket outlets, circuit protective devices etc); or installation of or alteration to any part of the fixed electrical wiring system (defined as electrical installing work),
d. which are luminaries,
e. in hazardous areas or on electrical equipment that is part of an explosion-protection technique.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836 ‘Safe working on low-voltage electrical installations.’

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP022A Disconnect and reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers isolating, disconnecting and reconnecting HV electric propulsion components on engine driven, self-propelled earth moving vehicles under the restrictions of designated electrical equipment and conditions specified, operating at 3,300 volts. It encompasses working safely, identifying circuit and isolation arrangements, following isolation procedures, selecting and using HV testing and measuring devices, terminating and connecting HV cables and conductors, safety testing and reporting.

Application of the Unit

Application of the Unit

2)

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as

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License to practice **3)**

apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Competencies needed for mechanical maintenance of HV electric propulsion components off-road earth moving trucks.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare for disconnection or reconnection	1.1	Designated HV electric propulsion components to be replaced is identified and purpose of the work to be carried out is verified with the authorised personnel.
		1.2	Occupational health and safety and other statutory requirements and established procedures are followed.
		1.3	Work clearances are obtained; isolation and disconnection procedures are followed in accordance with established procedures.
2	Disconnect designated HV electric propulsion components	2.1	Relevant electrical characteristics and protection specifications are identified.
		2.2	Where appropriate on –board cables are identified and marked and connection sequence recorded.
		2.3	Designated HV electric propulsion components are inspected for damage to components, and conclusions verified with authorised personnel.
		2.4	Visual checks of the designated HV electric propulsion components and associated wiring are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Isolated equipment is confirmed as de-energised.
	2.6	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	2.7	On –board cables are, where appropriate, disconnected without unnecessary damage to terminals or components.
	2.8	Designated HV electric propulsion components is dismantled, removed and/or replaced in accordance with requirements to the extent necessary for disconnection, and without unnecessary damage.
	2.9	Designated HV electric propulsion components parts and/or associated components are stored appropriately to protect them against damage.
	2.10	Repairs, where appropriate, to the removed equipment are carried out in accordance with requirements and established procedures.
3 Reconnect designated HV electric propulsion components	3.1	Cables, where appropriate, are re-connected without damage to terminals or components.
	3.2	Connections are checked and tested to confirm correct polarity and continuity.
	3.3	Designated HV electric propulsion components is assembled and checked to comply with the relevant Standards for the given technique.
	3.4	Designated HV electric propulsion components is tested for safety and correct operation.
4 Prepare designated HV electric propulsion components for return to service	4.1	Isolation devices are removed and work clearance is released in accordance with established procedures.
	4.2	Documentation is completed in accordance with

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ELEMENT	PERFORMANCE CRITERIA	
		established procedures.
	4.3	Operational personnel are notified when designated HV electric propulsion components are ready for return to service in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and disconnecting and reconnecting 3.3 kV electric propulsion components of self-propelled earth moving vehicles.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP022A Electrical Safety Principles

Evidence shall show an understanding of electrical safety principles to an extent indicated by the following aspects

T1 The basic electrical circuit encompassing:

- elements of a simple electric circuit (supply, control switch, protection device and load).
- definition, the symbol and the abbreviation of the unit for electromotive force, potential difference, current, resistance
- types of electrical load
- need for devices to afford electrical protection and the mechanisms used in protection devices including resetting
- symbols for the components of a basic electrical circuit
- connection of the circuit from the schematic diagram
- a.c supply (both single and three phase) and d.c. supply
- correct connection and use of voltmeters and ammeters, including the selection of correct range in terms of magnitude and whether the supply is a.c. or d.c.
- need for isolating, testing and tagging electrical circuits
- isolation, testing and tagging accessories in a simulated environment
- connecting a simple electrical circuit including supply, control switch and load.
- measuring voltage and current within a simple circuit

T2 Relationships in an electrical circuit encompassing:

- relationship between Voltage, Current and Resistance
- connection of meters to determine resistance from voltmeter and ammeter readings using a variation of the Ohm’s Law relationship
- predicting changes in circuit parameters for altered values of voltage, current and resistance
- definition of ‘power’ in electrical terms (for d.c. or resistive a.c. circuits)
- using circuit readings determine power using the appropriate equations, symbols and unit abbreviations including the use of multiples and sub multiples

T3 Electrical diagrams encompassing:

- symbols used for fuse, circuit breaker, isolator, normally open contacts, normally

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REQUIRED SKILLS AND KNOWLEDGE

closed contacts, coil, energy meter, a.c. motor, transformer.

- using a ‘block diagram’ as means of developing concepts and understanding
- producing a block diagram of a simple circuit
- function of single line diagrams including their application in three phase systems
- definition of a ‘circuit’ or ‘schematic’ diagrams
- wiring diagrams
- connecting a simple circuit using a schematic diagram noting the wide degree of variety in the way the conductors may be run
- producing the wiring diagram of the connections used in following the schematic diagram
- connecting a simple circuit following a wiring diagram
- producing a schematic diagram from the wiring diagram

T4 Test equipment – selection and care encompassing:

- fault currents and the implications of incorrectly connecting a meter to a high fault current source
- category ratings of multimeters in terms of their breaking capacity (fault current interruption) and identification of the appropriate category of instrument for typical domestic work and for typical commercial work.
- regulatory requirements in regard to the maintenance and testing of test instrumentation.
- steps and procedures for the safe use, care and storage of electrical instruments.
- selecting test equipment for given situations.

T5 Test equipment - Voltage measurement encompassing:

- voltage measurement -meters connected in parallel
- operation of series test lamps
- construction of a set of series test lamps with emphasis on safety requirements
- using a set of series test lamps
- operation of neon test pencils and test screwdrivers with emphasis on the limitations of their safe use
- operation and limitations of voltage probes including their limitations
- using an analog multimeter for voltage measurement ensuring the following - setting zero, correct scale; ac or dc, polarity and magnitude, avoiding parallax error and estimating between division readings
- using a digital multimeter for voltage measurement ensuring the following - correct range and no active conductors are connected to any meter earth

T6 Test equipment - Resistance measurement encompassing:

- voltmeter-ammeter method of resistance measurement
- measuring resistance in a simple circuit using the voltmeter-ammeter method with emphasis on the correct choice of long or short shunt
- measuring resistance in a simple circuit using an analog multimeter ensuring the following - setting zero, selecting correct range, estimating of between division

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REQUIRED SKILLS AND KNOWLEDGE

readings

- measureing resistance using a digital multimeter
- insulation resistance, and list the required minimum values for insulation resistance for low voltage wiring and low voltage equipment (insulation resistance between active and earth the value for appliances incorporating heating elements)
- insulation resistance needs to be measured at higher than supply voltage and list the voltages to be used
- conducting insulation resistance tests using a hand held tester after checking for zero and meter calibration
- continuity and what a continuity tester does
- checking the polarity of a three core extension cord using a continuity tester

T7 Test equipment - Current measurement encompassing:

- advantage(s) of the clip-on method of current measurement
- measuring current in a simple circuit using a multimeter on the correct current range and explain why a series connection must be used
- measuring current using a clip-on (tong tester) taking each circuit conductor in turn.

KS02-EP022A Disconnect and Reconnect HV Electric Propulsion Components

Evidence shall show an understanding of disconnect and reconnect HV electric propulsion components on off-road earth moving trucks to an extent indicated by the following aspects:

T1 Cable connections encompassing:

- construction of typical power cables.
- principle of operation of the following types of terminals stud, screw, tunnel, faston and soldered
- cable preparation and terminating methods appropriate to each type of terminal, including any special requirements which apply
- terminating cables using all of the above terminal types employing the correct preparation and the relevant terminating tools including the correct size soldering equipment.

T2 Protection for Safety encompassing:

- dangers associated with earth-faults.
- protection of persons against electric shock from earth-faults.
- maintaining a low earth-fault current path resistance.
- components in an earth-fault current path.
- testing the resistance of a fault-current path.
- regulatory issues/requirements/limitations in regards to working live

T3 Safety testing preparation and procedures encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- faulty earth-fault current paths
- using safe working practices when carrying out fault finding work.
- Identification of earthing system components.
- unsatisfactory resistance of a fault-current path.
- actions to rectify unsatisfactory resistance of an earth-fault current path or insulation.

T4 Isolating supplies encompassing:

- regulatory requirements in regards to working de-energised, and ensuring and maintaining isolation
- reasons for advising all personnel likely to be affected:
- preventing others wanting to remake supply
- reason for isolation and approximate time of outage to allow planning of alternate activities
- identification the type and arrangement of circuits supplying equipment that is to be disconnected
- availability of supply is tested at an components about to be disconnected
- locating isolation device/s e.g. lockable adjacent isolating switch or fuse/circuit breaker at a distribution board usually identified at the appliance
- determining the method of isolation to be used; which available device
- isolating a supply at a fuse, the fuse wedge is removed only after the components is turned off and why the empty wedge is replaced once the fusible link has been removed
- tests to determine if an components is turned off when isolating at a fuse/circuit breaker
- use of and reason for danger tags at the point of isolation
- reason for the following steps: testing on a known live supply, testing for isolation, retesting on a known live supply after confirming isolation

T5 Disconnecting an 3.3 kV electric propulsion components encompassing:

- identification of the type and arrangement of circuits supplying electric propulsion components that is to be disconnected from a 3.3 kV supply.
- procedures that ensure the safe isolation of the supply to electric propulsion components which is to be disconnected
- disconnection of isolated electric propulsion components from fixed wiring with minimal damage to wiring system after ensuring no visible faults or damage, and the recording of conductor connection sequence
- termination practices in regard to disconnected wiring

T6 Reconnecting an 3.3 kV electric propulsion components encompassing:

- importance of checking the new electric propulsion components nameplate details against those of the electric propulsion components being replaced
- need to visually inspect and test the electric propulsion components electrical characteristics using suitable test equipment to ensure electric propulsion

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REQUIRED SKILLS AND KNOWLEDGE

components is safe to connect in regard to sufficiently high insulation resistance, arrangements for protection against indirect contact are undamaged and in place, appropriate IP rating, and arrangements for protection against dangers of mechanical movement are undamaged and in place

- compliance testing of the fixed electric propulsion components, ie insulation resistance and continuity
- testing the disconnected electric propulsion components for faults (open circuits, partial open circuits, short circuits, partial short circuits and earth faults), and recognise any unsatisfactory test results obtained
- procedures for electric propulsion components with unsatisfactory results - unsuitability for reconnection
- identification of the type and arrangement of circuits supplying electric propulsion components that is to be reconnected to a 3.3 kV supply
- procedures ensuring isolation of supply
- process to establish the integrity of the circuit to which the disconnected electric propulsion components is to be connected, including:
  - testing the resistance between the protective earthing conductor and neutral conductor as applicable is sufficiently low ie not greater than 2 ohms
  - insulation resistance of the active conductors is greater than 1 megohm
- engaging appropriately qualified person to rectify any noncompliance
- appropriate cable termination practices
- reconnection of electric propulsion components to fixed wiring with minimal damage to wiring system
- continuity between exposed conductive parts of the electric propulsion components and the main earth or metal switchboard enclosure
- restoring supply after ensuring correct connections, and all safety requirements have been met
- testing the supply at electric propulsion components
- restoring all mechanical protection eg terminal covers
- checking operation of reconnected electric propulsion components

T7 Produce documentation and reports

- need to produce status reports and documents to locate and identify isolation mechanisms for a wide range of circuits and associated loads.
- production of reports and documents to use a suitable procedure to safely disconnect a component from a 3.3 kV supply.
- content required in reports and documents used to safely determine the suitability of a component for reconnection to supply.
- producing reports and documents for the safe reconnection/commissioning of a component to the supply.

T8 Enterprise reporting and recording system

- purpose and extent of maintaining work activities records in an enterprise

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REQUIRED SKILLS AND KNOWLEDGE

- types of records for maintaining work activities in an enterprise
- methods for recording and maintaining work records
- work records for regulation requirements
- producing enterprise records and documents for the safe reconnection/commissioning of a component to the supply.

Evidence Guide

EVIDENCE GUIDE

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competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

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legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Disconnect and reconnect 3.3 kV electric propulsion components of self-propelled earth moving vehicles as described in 8) and including:

  a. Preparing to disconnect or reconnect of HV electric propulsion components of off-road self-propelled earth moving vehicles operating at 3,300 volts

  b. Disconnecting of HV electric propulsion components of off-road HV electric propulsion components on engine driven, self-propelled earth moving vehicles operating at 3,300 volts

  c. Repairing in accordance with established procedures HV electric propulsion components of off-road HV electric propulsion components on engine driven, self-propelled earth moving vehicles operating at 3,300 volts

  d. Reconnecting of HV electric propulsion components of off-road self-propelled earth moving vehicles operating at 3,300 volts

  e. Preparing of HV electric propulsion components of off-road HV electric propulsion components on engine driven, self-propelled earth moving vehicles operating at 3,300 volts for return to service

  f. Providing status report(s);

  g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

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- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to disconnecting and reconnecting 3.3 kV electric propulsion components of self-propelled earth moving vehicles.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 ‘Assessment Guidelines’.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to disconnecting and reconnecting of HV electric propulsion components of HV electric propulsion components on engine driven, self-propelled earth moving vehicles operating at 3,300 volts.

Note:

Limitations of this unit. This unit does not cover the knowledge and skills necessary for work:

a) Where high fault currents are possible,
b) On complex electrical work;
c) Associated with other than to disconnect and reconnect of HV electric propulsion components of off-road HV electric propulsion components on engine driven, self-propelled earth moving vehicles earth moving vehicles operating at 3,300 volts
d) Nor competencies associated with fixed wiring

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP023A HV Flexible Cables and Plugs

Modification History

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers attach flexible cords, cable(s) and plug(s), including trailing and feeder cables, to HV electrical equipment connected to a supply exceeding 1,000 volts a.c. or 1,500 volts d.c. This may be incidental to or a primary and regular function of work related to a principle function in the workplace – typically mining. It encompasses working safely, identifying plug configurations, selecting and using testing and measuring devices, terminating and connecting HV flexible cables, plugs and conductors, safety testing and reporting.

Application of the Unit

Application of the Unit **2)**

This unit applies to any formal recognition for this standard at the aligned AQF 3 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEP025A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
UEENEEP025A	Attach cords, cables and plugs to electrical equipment for connection to 1000 V a.c. or 1500 V d.c. supply

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Plan and prepare to attach flexible cable(s) and plug(s)	1.1	Work is planned and prepared to ensure OHS policies and procedures are followed, and the work is appropriately sequenced in accordance with requirements.
		1.2	Condition and ratings under which the flexible cable(s) and plug(s) is to operate is determined from requirements and in consultation with appropriate personnel followed by written instruction.
		1.3	Flexible cable(s) and plug(s) are selected to comply with standards and requirements for the condition and rating to be determined.
		1.4	Materials necessary to complete the work are obtained in accordance with established procedures and checked against job requirements.
		1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
2	Attach flexible cable(s) and plug(s)	2.1	OHS policies and procedures are followed.
		2.2	Flexible cable(s) is prepared without damage to insulation and conductors and in accordance with requirements.
		2.3	Equipment is earthed in accordance with requirements and as confirmed as de-energised.

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ELEMENT		PERFORMANCE CRITERIA	
		2.4	Visual checks of the electrical equipment and associated wiring are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
		2.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
		2.6	The integrity of insulated equipment is maintained in accordance with requirements.
		2.7	Conductors are connected to terminals in accordance with requirements to ensure the required polarity is affected.
3	Test equipment for operation and safety	3.1	Appropriate tests are conducted of the electrical equipment high voltage to ensure safe installation and operation.
		3.2	Approval is obtained from authorised personnel to confirm completion of work is in accordance with established procedures before supply is connected.
4	Provide status report(s)	4.1	Status report(s) are completed and notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and attaching flexible cables and plugs to electrical equipment connected to a HV supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP023A HV Flexible Cables and Plugs

Evidence shall show an understanding of attaching flexible cables and plugs to electrical equipment connected to a HV supply (i.e. exceeding 1000 V a.c. and 1,500 V d.c.) to an extent indicated by the following aspects

T1 Flexible cords/cables and plugs to suit given H.V applications, encompassing:

- Flexible cables and plugs to suit given H.V applications
- Types of multiphase plug H.V for a specific load and IP rating requirements.

T2 Safety of a H.V electrical apparatus (including basic principles of its operation non-mathematical and control) of an appliance for connection to the supply, encompassing:

- Appropriate test equipment to check that apparatus is safe.
- Procedures to be followed to ensure the correct use of test equipment.
- Basic principles of operation and control of apparatus supplied by the flexible cables and plug.
- Test results that show apparatus is unsafe.

T3 Connection of flexible cables and plugs to multiphase appliances, encompassing:

- Preparation of flexible cables for connection to H.V apparatus.
- Connection of flexible cables to H.V. apparatus.
- Connection of a HV plug to a flexible cable.

T4 Safety of flexible cable and plug assembly, encompassing:

- Plug and cord testing procedures.
- Safe operation of apparatus supplied by HV cable and plug assembly

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this

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Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Attach flexible cables and plugs to electrical equipment connected to a high voltage supply as described in 8) and including:

    a. Planning and preparing to attach flexible cable(s) and plug(s) connected to HV electrical equipment

    b. Attaching, replacing and repairing flexible cable(s) and plug(s) connected to HV electrical equipment

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c. Testing flexible cable(s), plug(s) and electrical equipment connected to HV electrical equipment for operation and safety
d. Providing status report(s)
e. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to attaching flexible cables and plugs to electrical equipment connected to a HV supply.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to flexible cables and plugs for connecting equipment intended to operate at HV.

Note:

Limitations of this unit. This unit does not cover the knowledge and skills necessary for work:

a. Where high fault currents are possible,
b. On complex electrical work;
c. Nor competencies associated with fixed wiring

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers attaching flexible cords and plugs to electrical equipment for connection to supplies up to 230V a.c. This may be incidental to or a primary and regular function of work related to a principle function in the workplace. It encompasses working safely, identifying plug configurations, selecting and using testing and measuring devices, terminating and connecting cords/plugs and conductors, safety testing and reporting.

Application of the Unit

Application of the Unit **4**)

This unit applies to any formal recognition for this standard at the aligned AQF 2 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1	Plan and prepare to attach flexible cord(s) and plug(s).	1.1 Work is planned and prepared to ensure OHS policies and procedures are followed, and the work is appropriately sequenced in accordance with requirements.
		1.2 Condition and ratings under which the flexible cords and plugs are to operate is determined from requirements and in consultation with appropriate personnel followed by written instruction.
		1.3 Flexible cords and plugs are selected to comply with standards and requirements for the condition and rating to be determined.
		1.4 Materials necessary to complete the work are obtained in accordance with established procedures and checked against job requirements.

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		1.5 Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.6 Flexible cord(s) is prepared without damage to insulation and conductors and in accordance with requirements.
2	Attach flexible cord(s) and plug(s).	2.1 OHS policies and procedures are followed.
		2.2 Single insulated metal framed equipment is earthed in accordance with requirements.
		2.3 The integrity of double insulated equipment is maintained in accordance with requirements.
		2.4 Conductors are connected to terminals in accordance with requirements to ensure the required polarity is affected.
3	Test equipment for operation and safety.	3.1 Appropriate tests of the cord(s) and plug(s) connected to the electrical equipment are conducted in accordance with requirements and to established procedures to ensure safe installation and operation.
		3.2 Ongoing checks of the quality of work are undertaken in accordance with established procedures.
4	Locate and repair fault(s) in attached flexible cord(s) and plug(s).	4.1 Electrical equipment and attached flexible cord(s) and plug(s) are isolated, where necessary, in accordance with established procedures.
		4.2 Other OHS policies and procedures are followed.
		4.3 Visual checks of the attached flexible cord(s) and plug(s) are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
		4.4 Fault(s) in attached flexible cord(s) and plug(s) are confirmed and components to be replaced are determined and details recorded in accordance with established procedures.

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		4.5 Fault(s) in attached flexible cord(s) and plug(s) are repaired in accordance with established procedures, where necessary.
		4.6 Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
5	Provide status report(s).	5.1 Status report(s) are completed and notified in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and attaching cords and plugs to electrical equipment for connection to a single phase 230 Volt supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP024A	**Flexible cords and plugs to 230 V**
Evidence shall show an understanding of flexible cords and plugs to 230 V to an extent indicated by the following aspects	
T1 Safety encompassing:	
	* OH&S and electrical safety requirements
	* requirements of AS/NZS 4836:2001 Safe working practices on low voltage installations

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T2 The basic electrical circuit encompassing:

* simple electric circuit (supply, control device and load)

* symbol, units of measurement and the abbreviation for electromotive force, potential difference, current and resistance.

* drawing of a basic electrical circuit using correct symbols

* using multiples and submultiples for voltage, current and resistance values

* a.c and d.c supplies

* single phase electrical loads

* electrical circuit protection devices

T3 Relationships in an electrical circuit encompassing:

* relationship between voltage, current and resistance (Ohm’s law)

* changes in circuit parameters for altered values of voltage, current and resistance

* electrical power in relationship to d.c. or resistive a.c. circuits

T4 Test Equipment - resistance measurement encompassing:

* types of electrical test equipment used for resistance measurement (analogue and digital multimeters, insulation resistance testers and continuity testers)

* selection of appropriate electrical test instrument for continuity and insulation resistance measurement

* using analogue and digital multimeters for resistance measurement (ensuring zero setting, correct scale selection, avoidance of parallax error and estimation of between division readings for analogue multimeters)

* continuity tests and using a continuity tester to check

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	the polarity of a three core extension cord * insulation resistance tests and minimum values for insulation resistance for low voltage equipment * reasons for insulation resistance testing is conducted at higher than supply voltage (AS/NZS3000 requirements) * using insulation resistance hand held tester * care and storage of electrical instruments * regulatory requirements in regard to the maintenance and testing of test instrumentation for resistance measurement.
T5 Selection of flexible cords and plugs to suit given applications encompassing:	
	* types , structures and applications of common cores (parallel two core unsheathed (‘figure 8’) cords, light duty sheathed, ordinary duty sheathed, heavy duty sheathed and textile braided) * determining the current rating of a range of commonly used flexible cords * service duty * purpose of colour coding and the recommended single phase colour code and the conventional code used in the most common alternative colours * selection of appropriate flexible cords for a range of single phase appliances in regard to application, load, and service duty * identification of correct plug and socket polarities for the range of commonly used 230 volt plug socket combinations * factors affecting the choice of plugs and sockets including IP rating * selection of the correct plug and socket combinations for a range of applications including use in damp areas

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T6 Connecting flexible cords and plugs to appliances encompassing:

* design features of plugs and sockets which protect the conductor terminations from undue force when disconnecting a cord - tortuous path

* cord preparation - not to mark/damage the inner core when stripping the sheath for termination, double the end of the conductor to be terminated

* purpose of earthing

* structure of double insulated appliances, symbol, reasons they should not be earthed, and maintenance of the integrity of the double insulation

* preparation of the surfaces at an earthing connection before and after completion of the termination including terminations exposed to corrosion, and those for which no specific earthing terminal is provided

* fitting a range of various plugs and sockets with attention to requirements, colour code, polarity, and correct termination of conductors with the sheath well into the body, and the cord grip anchored

* terminate cords to several appliances utilising the appropriate cord type and rating

T7 Testing encompassing:

* importance of conducting both visual and electrical tests to ensure leads are safe and appropriate for connection to supply in regard to physical condition, sufficiently high insulation resistance, continuity, arrangements for protection against indirect contact are undamaged and in place, appropriate IP rating, and arrangements for protection against dangers of mechanical movement as relevant are undamaged and in place

* check polarity of plug, and for any abnormal or obvious damage or fault

* minimum acceptable value of insulation resistance between active neutral and earth

* conduct insulation resistance and continuity tests

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	prior to, and after, connecting cords and plugs to appliances
	* fault finding attached cords and plugs, and cord extension leads
T8 Producing documentation and reports encompassing:	
	* nature and content of, and the need to produce, status reports and documents
	* Producing status reports and documents

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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EVIDENCE GUIDE

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply as described in 8) and including:

A Demonstrating consistent performance for each element of the unit

B Meeting the performance criteria associated with each element of competence by employing the techniques, procedures, information and resources

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EVIDENCE GUIDE

	available in the workplace
C	Demonstrating an understanding of the underpinning knowledge and skills shown in the Essential Knowledge and Associated Skills section of the unit
D	Planning and preparing to attach flexible cord(s) and plug(s) up to 230 V a.c
E	Attaching, replacing and repairing flexible cord(s) and plugs(s) to equipment, safely up to 230 V a.c
F	Testing flexible cord(s), plugs(s) and connected equipment for operation and safety up to 230 V a.c., including polarity and continuity testing
G	Finding and repairing fault(s) in attached flexible cord(s) and plug(s) in accordance with established procedures
H	Providing status report(s)
I	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to attaching cords and plugs to electrical equipment for connection to a single phase 230 Volt supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any cord, cable and plug connected equipment or cord extension leads intended for single-phase supplies up to 230 V.

Note:

Limitations of this unit. This unit does not cover the knowledge and skills necessary for work:

a) Competencies associated with high current faults

b) On complex electrical apparatus, circuits and electrical work

c) In hazardous areas or on electrical equipment that is part of an explosion protection technique

d) Nor competencies associated with fixed wiring.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836:2001 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Custom Content Section

2.2) Literacy and numeracy skills

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Competency Field

Competency Field **5)**

Restricted and Specialisations

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UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

Modification History

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers attaching flexible cords, cables and plugs to electrical equipment connected to a supply up to 1,000V a.c. or 1,500V d.c. This may be incidental to or a primary and regular function of work related to a principle function in the workplace. It encompasses working safely, identifying plug configurations, selecting and using testing and measuring devices, terminating and connecting flexible cords/plugs and conductors, safety testing and reporting.

Application of the Unit

Application of the Unit **4**)

This unit applies to any formal recognition for this standard at the aligned AQF 2 level or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
Candidates are to meet regulator eligibility requirements by providing formal confirmation from the relevant state/territory regulator for the respective work class and scope of work prior to developing and being conferred competent.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 volt supply

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Employability Skills Information

Employability Skills **3**)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency

Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Plan and prepare to attach flexible cord/cables(s) and plug(s).	1.1	Work is planned and prepared to ensure OHS policies and procedures are followed, and the work is appropriately sequenced in accordance with requirements.
	1.2	Condition and ratings under which the flexible cord/cable(s) and plug(s) are to operate is determined from requirements and in consultation with appropriate personnel followed by written instruction.
	1.3	Flexible cord/cable(s) and plug(s) are selected to comply with standards and requirements for the condition and rating to be determined.
	1.4	Materials necessary to complete the work are obtained in accordance with established procedures and checked against job requirements.

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ELEMENT		PERFORMANCE CRITERIA	
		1.5	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety.
		1.6	Flexible cord/cable(s) is prepared without damage to insulation and conductors and in accordance with requirements.
2	Attach flexible cord(s)/cable(s) and plug(s).	2.1	OHS policies and procedures are followed.
		2.2	Single insulated metal framed equipment is earthed in accordance with requirements.
		2.3	The integrity of double insulated equipment is maintained in accordance with requirements.
		2.4	Conductors are connected to terminals in accordance with requirements to ensure the required polarity is affected.
3	Test equipment for operation and safety.	3.1	Appropriate tests of the cord/cable(s) and plug(s) connected to the electrical equipment are conducted in accordance with requirements and to established procedures to ensure safe installation and operation.
		3.2	Ongoing checks of the quality of work are undertaken in accordance with established procedures.
4	Locate and repair fault(s) in attached flexible cord(s) and plug(s).	4.1	Electrical equipment and attached flexible cord(s) and plug(s) are isolated, where necessary, in accordance with established procedures.
		4.2	Other OHS policies and procedures are followed.
		4.3	Visual checks of the attached flexible cord(s) and plug(s) are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
		4.4	Fault(s) in attached flexible cord(s) and plug(s) are confirmed and components to be replaced are determined and details recorded in accordance with established procedures.
		4.5	Fault(s) in attached flexible cord(s) and plug(s) are repaired in accordance with established procedures,

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ELEMENT	PERFORMANCE CRITERIA	
		where necessary.
	4.6	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
5 Provide status report(s).	5.1	Status report(s) are completed and notified in accordance with established procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and attaching cords and plugs to electrical equipment for connection to 1000 V a.c. or 1500 V d.c. supply.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

.KS01-EP025A Flexible cords/cables and plugs to 1000 V

Evidence shall show an understanding of flexible cords/cables and plugs to 1000 V to an extent indicated by the following aspects

T1 Safety encompassing:

- OH&S and electrical safety requirements
- requirements of AS/NZS 4836:2001 Safe working practices on low voltage installations

T2 Selection of flexible cords/cables and plugs to suit given applications encompassing:

- multiphase systems
- structure of plug pin configuration
- applications of commonly used flexible cords/cables and plugs for connection to 1000 Va.c. or 1500 Vd.c. supply
- determining the current rating of a range of commonly used flexible cords/cables and plugs for connection to 1000 Va.c. or 1500 Vd.c. supply
- determining the number of cores /pins required for given situations
- multiphase colour code and the conventional code used in the most common cords/cables
- selecting flexible cords/cables for given multiphase loads to 1000 V and service

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REQUIRED SKILLS AND KNOWLEDGE

duty.

- selecting multiphase plugs to 1000 V for a given load and IP rating.
- selecting the correct plug and socket combinations for a range of applications including use in damp areas

T3 Connect flexible cords/cables and plugs to multiphase equipment encompassing:

- design features of plugs and sockets which protect the conductor terminations from undue force when disconnecting a cord - tortuous path
- cord preparation - not to mark/damage the inner core when stripping the sheath for termination, double the end of the conductor to be terminated
- preparation of the surfaces at an earthing connection before and after completion of the termination including terminations exposed to corrosion, and those for which no specific earthing terminal is provided
- prepare flexible cords/cables for connection
- single insulated metal framed equipment is earthed in accordance with requirements or the integrity of double insulated equipment is maintained
- fitting a range of various multiphase flexible cords/cables, plugs, and sockets with attention to tortuous path requirements, colour code, polarity, and correct termination of conductors with the sheath well into the body, and the cord grip anchored

T4 Determine that a flexible cord/cable and plug is safe and is connected correctly encompassing:

- importance of conducting both visual and electrical tests to ensure leads are safe and appropriate for connection to supply in regard to physical condition, sufficiently high insulation resistance, continuity, arrangements for protection against indirect contact are undamaged and in place, appropriate IP rating, and arrangements for protection against dangers of mechanical movement as relevant are undamaged and in place
- check polarity of plug, and for any abnormal or obvious damage or fault
- minimum acceptable value of insulation resistance between actives, neutral and earth
- conduct insulation resistance and continuity tests prior to, and after, connecting cords/cables and plugs to appliances
- fault finding attached multiphase flexible cords/cables and plugs, and multiphase cord extension leads

T5 Producing documentation and reports encompassing:

- nature and content of, and the need to produce, status reports and documents
- producing status reports and documents

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Attach cords and plugs to electrical equipment for connection to 1000 V a.c. or 1500 Vd.c. supply as described in 8) and including:

A Demonstrating consistent performance for each element of the unit

B Meeting the performance criteria associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace

C Demonstrating an understanding of the underpinning knowledge and skills shown in the Essential

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EVIDENCE GUIDE

Knowledge and Associated Skills section of the unit

D Planning and preparing to attach flexible cords/cables and plugs up to 1,000V a.c. to 1,500V d.c.

E Replacing and repairing flexible cords/cables and plugs up to 1,000V a.c. to 1,500V d.c

F Attaching, replacing and repairing flexible cords/cables, plugs to equipment for operation, safely up to 1,000V a.c. to 1,500V d.c

G Testing flexible cords/cables, plugs and equipment for operation and safety up to 1,000V a.c. to 1,500V d.c

H Finding and repairing fault(s) in attached flexible cords/cables and plugs in accordance with established procedures

I Providing status report(s)

J Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to attaching cords and plugs to electrical equipment for connection to 1000 V a.c. or 1500 Vd.c. supply.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEP024A	Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall/may be demonstrated in relation to any cord/cable and plug connected equipment or cord/cable extension leads intended for multi phase supplies up to 1,000V a.c. to 1,500V d.c.

Note:

Limitations of this unit. This unit does not cover the knowledge and skills necessary for work:

a) Competencies associated with high current faults

b) On complex electrical apparatus, circuits and electrical work

c) In hazardous areas or on electrical equipment that is part of an explosion protection technique

d) Nor competencies associated with fixed wiring.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836:2001 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Custom Content Section

2.2) Literacy and numeracy skills

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Competency Field

Competency Field **5**)

Restricted and Specialisations

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UEENEEP026A Conduct in-service safety testing of electrical cord connected equipment and cord assemblies

Modification History

Release	Action	Core/Elective	Details	Points
2	Edit		Add "Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed" in **Competencies 4.1)**	

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers safety testing of electrical cord connected equipment and cord assemblies. It encompasses working safely, using portable apparatus tester, identifying faults, applying tagging, arranging for repair of faulty equipment and complete testing documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a license to practice in the workplace. However, practice in this unit is subject to regulations directly

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License to practice **3)**

related to occupational health and safety, general electrical safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

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Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to test cord connected apparatus and cord assemblies	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	OHS risk control work preparation measures and procedures are followed.
	1.3	Advice is sought from an appropriate person to minimise disruption to the work place.
	1.4	Cord connected apparatus and cord assemblies to be tested are obtained.
	1.5	Portable apparatus testing device is checked for correct operation and safety.
2 Test cord connected apparatus and cord assemblies	2.1	OHS risk control work measures and procedures are followed.
	2.2	Measures are followed to ensure that cord

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ELEMENT	PERFORMANCE CRITERIA	
		connected apparatus and cord assemblies to be tested are not connected to the electrical supply.
	2.3	Knowledge of electrical safety requirements and parameters are applied to safety testing to ensure correct interpretation of test results.
	2.4	Visual checks of the cord connected apparatus and cord assemblies are carried out in accordance with established procedures to detect any abnormal or obvious damage or fault.
	2.5	Approval is obtained in accordance with established procedures from appropriate personnel, before any contingencies are implemented.
	2.6	Established PAT routines are followed to test cord connected apparatus and cord assemblies.
	2.7	Unsafe cord connected apparatus and cord assemblies are identified from test results
	2.8	Testing is undertaken effectively with minimum waste of energy and damage to apparatus.
3 Tag tested cord connected apparatus and cord assemblies and document testing activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Cord connected apparatus and cord assemblies are tagged according to their safety status.
	3.4	Arrangements are made for unsafe cord connected apparatus and cord assemblies to be repaired by a recognised competent person.
	3.5	Safety testing activities are documented in accordance with requirements and established routines procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and conduct in-service safety testing of electrical cord connected equipment and cord assemblies.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EP026A Testing and Tagging Portable and Cord Connected Electrical Apparatus

Evidence shall show an understanding of testing and tagging portable and cord connected electrical apparatus to an extent indicated by the following aspects:

T1 Australian Standards and Commonwealth/State/Territory legislation and regulations encompassing:

- Australian Standard AS/NZS 3760
- Commonwealth/State/Territory Occupational Health and Safety Acts and Regulations
- Limitations of work that can be undertaken
- Codes of Practice and associated guidance material
- Risk management principles

T2 Basic electrical testing concepts encompassing:

- Basic electrical circuits
- Functions of electrical circuit
- Conductors and insulators
- Basic electrical supply system
- Relationship of electrical quantities
- Effects of electrical currents
- Methods/devices used to negate or minimise electrical shock
- Portable Appliance Testers (PAT)
- PAT maintenance and calibration

T3 Electrical equipment and cord assemblies testing encompassing:

- Classification of electrical equipment
- Inspection of electrical equipment (visual inspections)
- Using PAT:
  - Earth continuity testing
  - Insulation resistance testing
  - Polarity testing (extension cords and IEC cords)

T4 Testing and tagging documentation requirements encompassing:

- Risk assessment documentation

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REQUIRED SKILLS AND KNOWLEDGE

- frequency of inspection and testing
- tagging of equipment
- records maintenance

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this Unit and shall be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be ‘rich’ in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing

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assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Conduct in-service safety testing of electrical cord connected equipment and cord assemblies as described in 8) and including:

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a. Preparing the portable apparatus tester
b. Connecting cords and apparatus to the testing apparatus
c. Using test results to establish the safety status
d. Identifying safe and unsafe cords and apparatus
e. Applying appropriate tagging
f. Documenting testing activities
g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.
- Workplace evidence to be produced in an industry/regulator approved recording system (logbook) confirming skills development under appropriate supervision

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to conducting in-service safety testing of electrical cord connected equipment and cord assemblies.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to in-service safety testing of at least two different electrical cords and two different items of cord connected equipment with safety faults.

Safe Working. Safe procedures for working within in the scope of this unit shall be in accordance with AS/NZS 4836 'Safe working on low-voltage electrical installations.'

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Restricted and Specialisations

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UEENEER001B Contribute to the planning of a research project

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the ability to gather background information relevant to a research project, understand the context of the research project and contribute to the development of a research plan to achieve quality outcomes.

Application of the Unit

Application of the Unit **4**)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Acquire and understand background information relevant to the Research project.	1.1	Information sources about the research topic are identified and evaluated for reliability and validity.
	1.2	Information about the consumer, product, market and competition is collected, reviewed and understood.
	1.3	Key clients/stakeholders, their views and interests, are identified and recorded.
	1.4	The context (industrial, legal, ethical, political) of the research project is identified and understood.
2 Understand the Logistics of a Research Project.	2.1	Client, stakeholder and organisational requirements are identified and understood.
	2.2	Contractual obligations of the project are identified and understood.
	2.3	Resources available to support the project are identified and understood.
	2.4	Quality standards for the project are identified and understood.
3 Contribute to the planning of a Research Project	3.1	Project objectives, methodology and strategies appropriate to the requirements and contractual obligations of the project are identified and selected, in a team environment.
	3.2	Project phases, milestones, reporting and review points are identified, in a team environment.
	3.3	Criteria for evaluating each project deliverable against pre-defined quality standards are developed, in a team environment.
	3.4	A Research Plan is developed, in a team environment.

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ELEMENT	PERFORMANCE CRITERIA	
4 Seek endorsement and ensure distribution of a Research Project Plan	4.1	The draft Research Plan is forwarded to clients/stakeholders/appropriate personnel for perusal and comment.
	4.2	The draft Research Plan is amended to incorporate recommended improvements from clients/stakeholders/appropriate personnel.
	4.3	The final Research Plan is confirmed against overall project deliverables by appropriate personnel.
	4.4	The final Research Plan is distributed to all appropriate personnel and team members.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and contribute to the planning of a research project.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ER001B Research project planning

Evidence shall show that knowledge has been acquired of safe working practices and contribute to the planning of a research project.

T1 Project planning encompassing:

- Purpose of project planning
- Documents needed to plan a project
- Factors influencing sequence and restraints of project activities
- Critical path analysis encompassing:
  - Graphical representation methods
  - Methods of representing time/rates

T2 Project management encompassing:

- Defining project parameters - Project scope; Project stakeholders and clients; Project phases and the relationship between phases; Time requirements and limitations; Resource requirements and limitations; Quality requirements and limitations.
- Time management - time management concepts; standard practices for ensuring a project runs to time and the like.
- Financial management - Financial management concepts; Standard practices for managing project finances; Project budgets; Costs, variations and estimations; Invoicing against project phases/deliverables; Acquittals and the like.
- Quality management - Quality management concepts; Standard practices for managing quality within a project.
- Human Resource management - human resource management concepts; standard practices for managing personnel within a project
- Communication management - Communication management concepts; Standard practices for managing communication within a project and the like.
- Risk management and contingencies - risk management concepts; standard practices for managing risk within a project; Internal risks; External risks; Risk minimisation; Risk removal; Contingencies and the like.

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REQUIRED SKILLS AND KNOWLEDGE

- Procurement management - procurement management concepts; standard practices for managing procurement and the like.
- Physical Resource management - Types of physical resource, including; Equipment, Technology, Information, Facilities; Physical resource management concepts; Standard practices for managing physical resources
- Contracts - Understanding project contracts; Standard practices for working to contract specifications; Contract format; Contract content; Legal obligations of contract parties; Accompanying documentation including; Contract Schedules and the like.
- Performance assessment and continuous improvement - standard performance assessment practices; standard continuous improvement practices and the like
- Engineering ethics principles

T3 Research concepts encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research, The history of research; Past research successes; Past research failures; Research Protocols; Research practices and the like.
- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
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- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process.

T4 Work in a team encompassing:

- Types of teams - Managerial, Administrative, Project-based, Commercial and Social
- Roles, responsibilities and accountabilities of team members - the role, responsibility and accountability of individuals, teams, organisational management, clients and the like.
- Working in a team - Identification and utilisation of team member skills and knowledge; Maximising benefits of team diversity; Team planning; Team commitment and cooperation; Improving/Maximising team performance to achieve goals; Team monitoring and adjustment; Plain English literacy and communication; Leading, facilitating, participating, coaching, mentoring.
- Working with clients - client relations, client liaison, the practice of working with

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clients and the like.

- Conflict resolution – Personality analysis tools, Strategies for dealing with difficult people and the like.

T5 Scientific writing and communication encompassing:

- Types of scientific writing and communication - The distinguishing characteristics of the different types of scientific writing.
- Purpose of the different types of scientific writing - Product development justification and specifications; Management advice; Scientific papers/publications; Conference/meeting presentations; Policy documents; Planning documents; Reports and the like.
- Types of audience - The features and characteristics of an audience, including; an audience's professional, social, cultural, ethnic background and physical and academic capabilities; the importance of 'Plain English' written and oral communication.
- Scientific writing techniques - The component parts of scientific documents, including: Aim, Materials, Method, Results, Discussion, Conclusion, References; The required content of each component part; Scientific referencing techniques, including: Bibliographies, Reference Lists, Citations, Footnotes, Quotes, and Acknowledgements; Scientific labelling techniques, including: Graphs, Tables, Diagrams, and Figures; Techniques for documenting results, including: Text, Graphs, Tables, Diagrams, and Figures; Organisational standards for document and presentation production, including: Standard organisational document templates, letterheads, headers, footers, and logos.
- Oral communication techniques - Techniques for communicating to large groups, including; Conference presentations, Speeches; Techniques for communicating to small groups, including: Meeting presentations, Team discussions, planning forums and the like.
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- Confidentiality considerations - Confidentiality practices to protect the organisation; Confidentiality practices to protect the client; Confidentiality practices to protect providers of information/research cohorts.

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- Data types - Quantitative data, including; empirical, non-parametric, parametric; Qualitative data; Raw; Graphic; Diagrams; Original; Textual; Multimedia; Electronic and the like.
- Data Collection - Data sources; Consultation protocols and practices; Survey methodologies, including; interviews, surveys, chat rooms, focus groups; Literature reviews, including; traditional and web-based; Group facilitation and presentation; Questioning, active listening and clarification; Obstacles to data collection, including; unavailable data, inconsistent data, confidentiality, security; Data limitations.

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- Evaluating data quality - Reliability; Accuracy; Clarity; Validity; Contribution to research; Relevance to research objectives.

T7 Data analysis and presentation encompassing:

- Data analysis techniques - Univariate analysis; Multivariate analysis; Decision trees; Genetic Algorithms; Neural Networks; Gap Analysis; Urgency and impact, and the like.
- Data analysis technique selection - Determining the correct analysis technique(s); Determining the correct sequence of analysis techniques; Accommodating influencing factors including research objectives, budget, timeline and quality requirements, data limitations, confidentiality, security and the like.
- Data interpretation - Determining results; determining conclusions; Benchmarking; Quality Assurance, including consideration of accuracy, validity, clarity and the like.
- Data presentation:
  - Determining the correct form of presentation for the audience, including; colleagues, scientific community, marketing and commercialisation specialists, general community, industry, mixed (i.e. conference audience).
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- Identifying client and managerial requirements for production and trials - Required outcome(s); Key performance indicators; Timelines; Financing; Resources; Quality Assurance and the like.
- Influencing factors - Internal business goals and strategies; Technical specifications (chemical, mechanical, environmental); Industrial considerations; Regulatory considerations; Legislative considerations; Intellectual Property; Australian & International Standards; Codes of Practice; Market requirements; Resource requirements, including personnel tools and equipment (principles and practices), materials, finances and the like.
- Product development arrangements - Licensing agreements; Joint Ventures; Sole Ventures and the like.
- Relevant Documentation - Codes of Practice; Standard Operating Procedures; Product formulation documentation; Material safety data sheets (MSDSs); Equipment and Quality manuals; Calibration and maintenance schedules; Enterprise recording and reporting procedures; Material, equipment and product specifications and the like.
- Development & trial processes - Proof of concept; Trialing concepts; Definitions/Specifications; Types of development and trial processes, including Phase A product and trial, Phase B product and trial, User trials, Ergonomics and Usability testing; Pre-defined acceptance criteria, confidence limits; Data

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REQUIRED SKILLS AND KNOWLEDGE

collection & analysis; Production; Evaluation and recommendation formulation.

T9 Intellectual property concepts encompassing:

- Intellectual Property and Australian Law - The place of Intellectual Property in Australian Law; Past cases and outcomes; Necessary considerations and the like.
- The nature of Intellectual Property - What is Intellectual Property? What isn't Intellectual Property?; Why is Intellectual Property relevant?; What can Intellectual Property rights do?; What can't Intellectual Property rights do?
- Intellectual Property Rights - Patents; Copyright; Designs; Confidential Information; Other specialty rights and the like.
- Managing Intellectual Property - Identifying Intellectual Property; Deciding what to protect; Strategies for managing Intellectual Property; How can Intellectual Property rights work together?; Intellectual Property versus time, effort, finances; Sources of Assistance, including Publications, Intellectual Property professionals, Lawyers, Business Advisors, Marketing consultants and the like.
- Enforcement of Intellectual Property - The enforcement process; The role of lawyers; Resolution.
- The changing face of Intellectual Property - Development of Intellectual Property Right Laws; Changes to Intellectual Property Right laws; Extensions of Intellectual Property Rights into non-traditional areas, including cultural, property arenas; The global marketplace and the like.

T10 Commercialisation concepts encompassing:

- Commercialisation - Definition of commercialisation; Triggers for commercialisation; Past commercialisation successes; Past commercialisation failures; Triggers for commercialisation; Methods for identifying a good product/idea/service/application; Sources of assistance in regard to commercialisation, including documents; lawyers, business advisors, marketing consultants.
- The commercialisation process - The concept; Does the concept fit with the organisation's goals? Is there a market, what is the market? Will the product meet the market requirements? Can the product be sold? How can the product be sold? Can the product be produced? How can the product be produced? Can the production be repeated?
- Commercialisation arrangements - sole venture; Joint venture; Licensing; Legal aspects of commercialisation.
- Commercialisation planning - Costing; Marketing; Production/development; Distribution; Sales.
- Competition - Who are the competitors? What are they doing and how quickly? Internal development relevant to competition.
- Critical analysis of the commercialisation process for continuous improvement - Successes; Opportunities for improvement; Controllable influences; Uncontrollable influences; Formulation of recommendations.

T11 Occupational Health and Safety principles and fundamentals encompassing:

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- underlying principles of OH&S
- general aims and objectives of the relevant state or territory legislation relating to OH&S.
- employer and employee responsibilities, rights and obligations.
- major functions of safety committees and representatives.
- powers given to Occupational Health and Safety Inspectors
- housekeeping and potential hazards in relation to improper housekeeping
- selecting appropriate personal protective equipment (PPE) given hazardous situations

T12 The work environment encompassing:

- typical hazards associated with a range of work environments
- procedures used to control the risks associated with these hazards
- principles of risk assessment / management and state the purpose of each.
- hierarchy of OH&S hazard control measures.
- required documentation for risk assessment.
- commonly used workplace safety signs.
- workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
- appropriate fire extinguisher for a given type of fire.
- requirements for the location, mounting and maintenance of portable fire extinguishers.
- basic process of fighting a fire.
- safe premises, buildings and security are important in an industrial setting and the consequences of non- compliance with these.
- standard work procedure is and why they are required in some circumstances.

T13 Manual Handling encompassing:

- typical manual handling injuries and the effect they can have on lifestyle
- situations that may cause manual handling injuries
- correct procedures for lifting and carrying to prevent manual handling injuries
- Chemicals in the workplace encompassing:
- hazardous substances and dangerous goods.
- Classification of chemicals as hazardous substances and/or dangerous goods
- requirements for labelling of chemicals in the workplace
- safe storage procedures for chemicals
- purpose of and interpretation of material safety data sheet (MSDS)

T14 Working at heights encompassing:

- dangers associated with working on ladders and scaffolds
- identification of work area as a height risk and use appropriate safety equipment to prevent a fall
- selecting an appropriate ladder for a given situation and perform a safety check

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before use

- precautions that should be taken when ascending and working off a ladder
- precautions that should be taken when working on and around a scaffold and elevated platforms.

T15 Confined spaces encompassing:

- hazards associated with working in a confined space
- identifying workplace situations that could be classified as a confined space
- control measures for working in a designated confined space

T16 Physical and psychological hazards encompassing:

- short and long term effects of excessive noise and techniques to avoid damage to hearing due to excessive noise
- effects of vibration on the human body and work practices to protect against vibration
- effects of thermal stress on the human body and work practices to protect against thermal stress
- effects of ultraviolet (UV) radiation on the human body and work practices to protect against UV radiation.
- dangers associated with laser operated equipment and tools and suitable protective measures to overcome the danger.
- occupational overuse syndrome, state examples of how it occurs and describe means to overcome it
- factors that cause stress in the workplace, symptoms of a person suffering from stress and personal stress management techniques
- detrimental effects and dangers of drug and alcohol use in the workplace

T17 Working safely with electricity encompassing:

- effects of electric shock on the human body
- common causes of electrical accidents
- precautions that can minimise the chance of electric shock (earthing, extra low voltage, fuses, circuit breakers and residual current devices – RCDs)
- protection offered by a residual current device (RCD)
- need for ensuring the (safe) isolation of an electrical supply
- appropriate method of removing an electric shock victim from a live electrical situation

T18 Life support - CPR in the workplace encompassing:

- First Aid.
- responsibilities of the First Aider.
- priorities of first aid management for any accident or injury.
- procedures required at an accident scene.
- legal and ethical issues, which may impact on the management of care.
- 'Duty of Care'.

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REQUIRED SKILLS AND KNOWLEDGE

- examination of a casualty for injuries.
- effect of cardio pulmonary arrest on the body.
- Managing simulated conditions of: airway obstruction; respiratory arrest and cardio pulmonary arrest,
- single and two-person cardio pulmonary resuscitation (CPR).
- signs and symptoms of an altered level of consciousness
- management of simulation of a casualty with an altered level of consciousness.
- signs and symptoms of shock.
- management of simulation of a casualty in shock

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It shall be used in conjunction with all components parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity,

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EVIDENCE GUIDE

electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

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EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Contribute to the planning of a research project as described in 8) and including:

    A Demonstrating consistent performance for each Element of the unit

    B Meeting the performance criteria associated with each Element of the unit by employing techniques, procedures, information and resources available in the workplace

    C Demonstrating an understanding of the Underpinning Knowledge and Skills identified in the section of this unit titled 'Essential knowledge and associated skills'.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to contributing to the planning of a research project.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

BSXFM1504A	Participate in, lead and facilitate work teams
UEENEER002B	Contribute to the conduct of a research project
UEENEER003B	Contribute to the development of a

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EVIDENCE GUIDE

	product/application/service
UEENEER004B	Contribute to the trial of a product/application/service
UEENEER005B	Contribute to intellectual property management
BSBCMN306A	Produce business documents
BSBSBM405A	Monitor and manage business operations
UEENEER00A	Contribute to the commercialisation of a product/application/service
PMBQUAL309A	Solve problems using 'quality tools'

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit describes work conducted by technical personnel who contribute to the planning of research projects. Typically this work is performed by high-level technicians, working as part of a product/application/service research and/or design, development and implementation team. It generally involves working closely with a range of management and production/operations personnel and requires balancing the business and technical sides of the research process.

This unit does not require knowledge of industry sectors, equipment and/or materials other than that in which the learner works. It assumes an understanding of the operation of all relevant business processes but does not necessarily require them to be the responsibility of the learner.

At this level, personnel should be able to interpret and explain sections/types of legislation, codes, regulations, Australian Standards and Intellectual Property rights that apply to the subject matter to be researched.

This unit should be demonstrated in accordance with the organisation's:

- Occupational Health and Safety and Workplace Safety policies and procedures
- Goals, values, objectives, plans, systems and processes
- Business and performance plans
- Ethical standards
- Client service standards
- Quality and continuous improvement processes and standards
- Standard Operating Procedures
- Resources

The following constants and variables included in the Element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'.

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Research

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UEENEER002B Contribute to the conduct of a research project

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the ability to identify information sources and collect and analyse information in accordance with confirmed research project objectives and compile and present results in accordance with current business practices.

Application of the Unit

Application of the Unit **4**)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Confirm research parameters	1.1	Consultation with appropriate personnel is undertaken to ensure that the scope, objectives and expected outcomes of the research are understood.
		1.2	Timeframes, available resources, budget and quality standards for the research are confirmed and understood.
		1.3	The research methodology and strategies are confirmed and understood.
2	Identify sources and availability of information	2.1	The type and range of information required is clearly identified to meet research objectives.
		2.2	Information sources are identified and evaluated for their contribution to the research.
		2.3	Protocols and other procedures required to access information are clearly identified and appropriate action taken.
		2.4	Limitations on the availability of material are identified and appropriate action taken.
		2.5	Obstacles to the collection of information are identified and appropriate action taken.
3	Collect information to achieve research objectives	3.1	Information collection methods are applied correctly and consistently, in accordance with appropriate procedures and agreements reached with information sources.
		3.2	The types and range of information collected are in line with the research objectives.
		3.3	Information is recorded accurately and clearly in an appropriate format.
4	Analyse and compile research information	4.1	Methods of analysis and compilation are appropriate to the information collected and objectives of the research.
		4.2	Methodologies and procedures incorporate current technological developments and meet

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ELEMENT	PERFORMANCE CRITERIA	
		relevant industry standards.
	4.3	Results are obtained within the specified time, budget and quality constraints.
	4.4	Results are recorded accurately and clearly in appropriate format.
	4.5	Results are carefully interpreted and conclusions drawn.
	4.6	The results and conclusions are reviewed with appropriate personnel.
5 Present research results and conclusions.	5.1	A report/summary/presentation detailing the research results and conclusions is developed in accordance with current business practices.
	5.2	Confidential information is protected in accordance with predefined agreements and/or procedures.
	5.3	All sources of information are accurately acknowledged or cited in a recognised and appropriate format.
	5.4	The success of the research methodology is evaluated against the research objectives.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the conduct of a research project.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ER002B Conducting Research Projects

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the conducting of a research project.

T1 Project planning

- Purpose of project planning
- Documents needed to plan a project
- Factors influencing sequence and restraints of project activities
- Critical path analysis encompassing:
  - Graphical representation methods
  - Methods of representing time/rates

T2 Research concepts encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research, The history of research; Past research successes; Past research failures; Research Protocols; Research practices and the like.
- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
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REQUIRED SKILLS AND KNOWLEDGE

T3 Work in a team encompassing:

- Types of teams - Managerial, Administrative, Project-based, Commercial and Social
- Roles, responsibilities and accountabilities of team members - the role, responsibility and accountability of individuals, teams, organisational management, clients and the like.
- Working in a team - Identification and utilisation of team member skills and knowledge; Maximising benefits of team diversity; Team planning; Team commitment and cooperation; Improving/Maximising team performance to achieve goals; Team monitoring and adjustment; Plain English literacy and communication; Leading, facilitating, participating, coaching, mentoring.
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- Confidentiality considerations - Confidentiality practices to protect the

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REQUIRED SKILLS AND KNOWLEDGE

organisation; Confidentiality practices to protect the client; Confidentiality practices to protect providers of information/research cohorts.

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- Evaluating data quality - Reliability; Accuracy; Clarity; Validity; Contribution to research; Relevance to research objectives.

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  - Determining the correct form of presentation for the audience, including; colleagues, scientific community, marketing and commercialisation specialists, general community, industry, mixed (i.e. conference audience).
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- Influencing factors - Internal business goals and strategies; Technical specifications (chemical, mechanical, environmental); Industrial considerations; Regulatory considerations; Legislative considerations; Intellectual Property; Australian & International Standards; Codes of Practice; Market requirements;

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REQUIRED SKILLS AND KNOWLEDGE

Resource requirements, including personnel tools and equipment (principles and practices), materials, finances and the like.

- Product development arrangements - Licensing agreements; Joint Ventures; Sole Ventures and the like.
- Relevant Documentation - Codes of Practice; Standard Operating Procedures; Product formulation documentation; Material safety data sheets (MSDSs); Equipment and Quality manuals; Calibration and maintenance schedules; Enterprise recording and reporting procedures; Material, equipment and product specifications and the like.
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- Intellectual Property Rights - Patents; Copyright; Designs; Confidential Information; Other specialty rights and the like.
- Managing Intellectual Property - Identifying Intellectual Property; Deciding what to protect; Strategies for managing Intellectual Property; How can Intellectual Property rights work together?; Intellectual Property versus time, effort, finances; Sources of Assistance, including Publications, Intellectual Property professionals, Lawyers, Business Advisors, Marketing consultants and the like.
- Enforcement of Intellectual Property - The enforcement process; The role of lawyers; Resolution.
- The changing face of Intellectual Property - Development of Intellectual Property Right Laws; Changes to Intellectual Property Right laws; Extensions of Intellectual Property Rights into non-traditional areas, including cultural, property arenas; The global marketplace and the like.

T9 Occupational Health and Safety principles and fundamentals encompassing:

- underlying principles of OH&S
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- housekeeping and potential hazards in relation to improper housekeeping
- selecting appropriate personal protective equipment (PPE) given hazardous

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REQUIRED SKILLS AND KNOWLEDGE

situations

T10 The work environment encompassing:

- typical hazards associated with a range of work environments
- procedures used to control the risks associated with these hazards
- principles of risk assessment / management and state the purpose of each.
- hierarchy of OH&S hazard control measures.
- required documentation for risk assessment.
- commonly used workplace safety signs.
- workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
- appropriate fire extinguisher for a given type of fire.
- requirements for the location, mounting and maintenance of portable fire extinguishers.
- basic process of fighting a fire.
- safe premises, buildings and security are important in an industrial setting and the consequences of non- compliance with these.
- standard work procedure is and why they are required in some circumstances.

T11 Manual Handling encompassing:

- typical manual handling injuries and the effect they can have on lifestyle
- situations that may cause manual handling injuries
- correct procedures for lifting and carrying to prevent manual handling injuries
- Chemicals in the workplace encompassing:
- hazardous substances and dangerous goods.
- Classification of chemicals as hazardous substances and/or dangerous goods
- requirements for labelling of chemicals in the workplace
- safe storage procedures for chemicals
- purpose of and interpretation of material safety data sheet (MSDS)

T12 Working at heights encompassing:

- dangers associated with working on ladders and scaffolds
- identification of work area as a height risk and use appropriate safety equipment to prevent a fall
- selecting an appropriate ladder for a given situation and perform a safety check before use
- precautions that should be taken when ascending and working off a ladder
- precautions that should be taken when working on and around a scaffold and elevated platforms.

T13 Confined spaces encompassing:

- hazards associated with working in a confined space
- identifying workplace situations that could be classified as a confined space

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REQUIRED SKILLS AND KNOWLEDGE

- control measures for working in a designated confined space

T14 Physical and psychological hazards encompassing:

- short and long term effects of excessive noise and techniques to avoid damage to hearing due to excessive noise
- effects of vibration on the human body and work practices to protect against vibration
- effects of thermal stress on the human body and work practices to protect against thermal stress
- effects of ultraviolet (UV) radiation on the human body and work practices to protect against UV radiation.
- dangers associated with laser operated equipment and tools and suitable protective measures to overcome the danger.
- occupational overuse syndrome, state examples of how it occurs and describe means to overcome it
- factors that cause stress in the workplace, symptoms of a person suffering from stress and personal stress management techniques
- detrimental effects and dangers of drug and alcohol use in the workplace

T15 Working safely with electricity encompassing:

- effects of electric shock on the human body
- common causes of electrical accidents
- precautions that can minimise the chance of electric shock (earthing, extra low voltage, fuses, circuit breakers and residual current devices – RCDs)
- protection offered by a residual current device (RCD)
- need for ensuring the (safe) isolation of an electrical supply
- appropriate method of removing an electric shock victim from a live electrical situation

T16 Life support - CPR in the workplace encompassing:

- First Aid.
- responsibilities of the First Aider.
- priorities of first aid management for any accident or injury.
- procedures required at an accident scene.
- legal and ethical issues, which may impact on the management of care.
- 'Duty of Care'.
- examination of a casualty for injuries.
- effect of cardio pulmonary arrest on the body.
- Managing simulated conditions of: airway obstruction; respiratory arrest and cardio pulmonary arrest,
- single and two-person cardio pulmonary resuscitation (CPR).
- signs and symptoms of an altered level of consciousness
- management of simulation of a casualty with an altered level of consciousness.

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REQUIRED SKILLS AND KNOWLEDGE

- signs and symptoms of shock.
- management of simulation of a casualty in shock

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It shall be used in conjunction with all components parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

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9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

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EVIDENCE GUIDE

more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Before the critical aspects of evidence are considered all prerequisites shall be met.

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- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Contribute to the conduct of a research project as described in 8) and including:

    A Demonstrating consistent performance for each Element of the unit

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EVIDENCE GUIDE

B Meeting the performance criteria associated with each Element of the unit by employing techniques, procedures, information and resources available in the workplace

C Demonstrating an understanding of the Underpinning Knowledge and Skills identified in the section of this unit titled 'Essential knowledge and associated skills'.

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EVIDENCE GUIDE

Method of assessment

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This unit shall be assessed by methods outlined in Volume 1, Part 3 'Assessment Guidelines'.

Note:
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Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

BSXFM1504A	Participate in, lead and facilitate work teams
UEENEER001B	Contribute to the planning of a research project
UEENEER003B	Contribute to the development of a product/application/service
UEENEER004B	Contribute to the trial of a product/application/service
UEENEER005B	Contribute to intellectual property management
BSBCMN306A	Produce business documents
BSBSBM405A	Monitor and manage business operations
UEENEER006B	Contribute to the commercialisation of a product/application/service
PMBQUAL309A	Solve problems using 'quality tools'

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit describes work conducted by technical personnel who contribute to the planning of research projects. Typically this work is performed by high-level technicians, working as part of a product/application/service research and/or design, development and implementation team. It generally involves working closely with a range of management and production/operations personnel and requires balancing the business and technical sides of the research process.

This unit does not require knowledge of industry sectors, equipment and/or materials other than that in which the learner works. It assumes an understanding of the operation of all relevant business processes but does not necessarily require them to be the responsibility of the learner.

At this level, personnel should be able to interpret and explain sections/types of legislation, codes, regulations, Australian Standards and Intellectual Property rights that apply to the subject matter to be researched.

This unit should be demonstrated in accordance with the organisation's:

- Occupational Health and Safety and Workplace Safety policies and procedures
- Goals, values, objectives, plans, systems and processes
- Business and performance plans
- Ethical standards
- Client service standards
- Quality and continuous improvement processes and standards
- Standard Operating Procedures
- Resources

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'.

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5**)

Research

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UEENEER003B Contribute to the development of a product/application/ service

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the ability to assist managers to plan, coordinate and report on the development of a product/application/service.

Application of the Unit

Application of the Unit **4**)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Contribute to the development of a design brief for a product/service/application.	1.1	Technical specifications, regulatory, industrial, intellectual property and market requirements of the product/application/service to be developed are negotiated with client(s), stakeholders and management and agreed on.
	1.2	Technical specifications, regulatory, industrial, intellectual property and market requirements of the product/application/service to be developed are confirmed.
	1.3	Resource requirements, including personnel, equipment and materials needed to develop the product/application/service area confirmed.
	1.4	Quality requirements and standards for development of the product/application/service are confirmed.
	1.5	A design brief for the product/application/service is developed in a team environment.
	1.6	Approval is obtained for the design brief from appropriate personnel.
2 Prepare to develop a product/application/service	2.1	The required outcome(s) as identified in design brief is confirmed with appropriate personnel.
	2.2	The product/application/service is developed in consultation with appropriate production personnel.
	2.3	A development procedure is formulated to: - deliver required quality outcome(s) - ensure OHS, environmental, industrial and regulatory requirements are stringently observed - ensure tooling, process, materials and equipment specifications are addressed
	2.4	Approval is obtained of the development procedure from appropriate personnel.

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ELEMENT	PERFORMANCE CRITERIA	
3 Contribute to the development of a product/application/service	3.1	The development procedure is confirmed with appropriate personnel.
	3.2	A product/application/ service product is developed in accordance with the design brief and development procedure.
	3.3	Development results are recorded in accordance with enterprise procedures.
	3.4	Develop results and identify characteristics which are outside design and development specifications are identified.
	3.5	Changes are recommended, as necessary, to achieve product/application/ service quality and production requirements.
	3.6	Approval of changes is obtained from appropriate personnel.
	3.7	Revision of the product/ application/service to achieve quality and production requirements is coordinated where necessary.
4 Document and report product/application/service development outcomes	4.1	All product/application/service development objectives are met.
	4.2	Product/application/service development reporting requirements are completed.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the development of a product/application/service.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ER003B Product/application/service development

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the development of a product/application/service.

T1 Project planning

- Purpose of project planning
- Documents needed to plan a project
- Factors influencing sequence and restraints of project activities
- Critical path analysis encompassing:
  - Graphical representation methods
  - Methods of representing time/rates

T2 Project management encompassing:

- Defining project parameters - Project scope; Project stakeholders and clients; Project phases and the relationship between phases; Time requirements and limitations; Resource requirements and limitations; Quality requirements and limitations.
- Time management - time management concepts; standard practices for ensuring a project runs to time and the like.
- Financial management - Financial management concepts; Standard practices for managing project finances; Project budgets; Costs, variations and estimations; Invoicing against project phases/deliverables; Acquittals and the like.
- Quality management - Quality management concepts; Standard practices for managing quality within a project.
- Human Resource management - human resource management concepts; standard practices for managing personnel within a project
- Communication management - Communication management concepts; Standard practices for managing communication within a project and the like.
- Risk management and contingencies - risk management concepts; standard practices for managing risk within a project; Internal risks; External risks; Risk minimisation; Risk removal; Contingencies and the like.

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REQUIRED SKILLS AND KNOWLEDGE

- Procurement management - procurement management concepts; standard practices for managing procurement and the like.
- Physical Resource management - Types of physical resource, including; Equipment, Technology, Information, Facilities; Physical resource management concepts; Standard practices for managing physical resources
- Contracts - Understanding project contracts; Standard practices for working to contract specifications; Contract format; Contract content; Legal obligations of contract parties; Accompanying documentation including; Contract Schedules and the like.
- Performance assessment and continuous improvement - standard performance assessment practices; standard continuous improvement practices and the like
- Engineering ethics principles

T3 Work in a team encompassing:

- Types of teams - Managerial, Administrative, Project-based, Commercial and Social
- Roles, responsibilities and accountabilities of team members - the role, responsibility and accountability of individuals, teams, organisational management, clients and the like.
- Working in a team - Identification and utilisation of team member skills and knowledge; Maximising benefits of team diversity; Team planning; Team commitment and cooperation; Improving/Maximising team performance to achieve goals; Team monitoring and adjustment; Plain English literacy and communication; Leading, facilitating, participating, coaching, mentoring.
- Working with clients - client relations, client liaison, the practice of working with clients and the like.
- Conflict resolution – Personality analysis tools, Strategies for dealing with difficult people and the like.

T4 Scientific writing and communication encompassing:

- Types of scientific writing and communication - The distinguishing characteristics of the different types of scientific writing.
- Purpose of the different types of scientific writing - Product development justification and specifications; Management advice; Scientific papers/publications; Conference/meeting presentations; Policy documents; Planning documents; Reports and the like.
- Types of audience - The features and characteristics of an audience, including; an audience's professional, social, cultural, ethnic background and physical and academic capabilities; the importance of 'Plain English' written and oral communication.
- Scientific writing techniques - The component parts of scientific documents, including: Aim, Materials, Method, Results, Discussion, Conclusion, References; The required content of each component part; Scientific referencing techniques, including: Bibliographies, Reference Lists, Citations, Footnotes, Quotes, and Acknowledgements; Scientific labelling techniques, including: Graphs, Tables,

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REQUIRED SKILLS AND KNOWLEDGE

Diagrams, and Figures; Techniques for documenting results, including: Text, Graphs, Tables, Diagrams, and Figures; Organisational standards for document and presentation production, including: Standard organisational document templates, letterheads, headers, footers, and logos.

- Oral communication techniques - Techniques for communicating to large groups, including; Conference presentations, Speeches; Techniques for communicating to small groups, including: Meeting presentations, Team discussions, planning forums and the like.
- Electronic communication formats - World-wide Web – protocols and practices; Email – protocols and practices; Transfer of information via CD Rom/Floppy Disk; Use of PDF and other secure files.
- Confidentiality considerations - Confidentiality practices to protect the organisation; Confidentiality practices to protect the client; Confidentiality practices to protect providers of information/research cohorts.

T5 Data collection techniques encompassing:

- Data types - Quantitative data, including; empirical, non-parametric, parametric; Qualitative data; Raw; Graphic; Diagrams; Original; Textual; Multimedia; Electronic and the like.
- Data Collection - Data sources; Consultation protocols and practices; Survey methodologies, including; interviews, surveys, chat rooms, focus groups; Literature reviews, including; traditional and web-based; Group facilitation and presentation; Questioning, active listening and clarification; Obstacles to data collection, including; unavailable data, inconsistent data, confidentiality, security; Data limitations.
- Evaluating data quality - Reliability; Accuracy; Clarity; Validity; Contribution to research; Relevance to research objectives.

T6 Data analysis and presentation encompassing:

- Data analysis techniques - Univariate analysis; Multivariate analysis; Decision trees; Genetic Algorithms; Neural Networks; Gap Analysis; Urgency and impact, and the like.
- Data analysis technique selection - Determining the correct analysis technique(s); Determining the correct sequence of analysis techniques; Accommodating influencing factors including research objectives, budget, timeline and quality requirements, data limitations, confidentiality, security and the like.
- Data interpretation - Determining results; determining conclusions; Benchmarking; Quality Assurance, including consideration of accuracy, validity, clarity and the like.
- Data presentation:
  - Determining the correct form of presentation for the audience, including; colleagues, scientific community, marketing and commercialisation specialists, general community, industry, mixed (i.e. conference audience).
  - Forms of documentary presentation, including reports, journal articles, scientific papers, graphs, tables, diagrams, electronic formats; Forms of verbal

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REQUIRED SKILLS AND KNOWLEDGE

presentation, including meetings, client briefings, conferences, support of a new concept, need for further research, commercialisation opportunity; Quality Assurance, including accuracy, validity, clarity of information presented.

T7 Product development and trials encompassing:

- Identifying client and managerial requirements for production and trials - Required outcome(s); Key performance indicators; Timelines; Financing; Resources; Quality Assurance and the like.
- Influencing factors - Internal business goals and strategies; Technical specifications (chemical, mechanical, environmental); Industrial considerations; Regulatory considerations; Legislative considerations; Intellectual Property; Australian & International Standards; Codes of Practice; Market requirements; Resource requirements, including personnel tools and equipment (principles and practices), materials, finances and the like.
- Product development arrangements - Licensing agreements; Joint Ventures; Sole Ventures and the like.
- Relevant Documentation - Codes of Practice; Standard Operating Procedures; Product formulation documentation; Material safety data sheets (MSDSs); Equipment and Quality manuals; Calibration and maintenance schedules; Enterprise recording and reporting procedures; Material, equipment and product specifications and the like.
- Development & trial processes - Proof of concept; Trialing concepts; Definitions/Specifications; Types of development and trial processes, including Phase A product and trial, Phase B product and trial, User trials, Ergonomics and Usability testing; Pre-defined acceptance criteria, confidence limits; Data collection & analysis; Production; Evaluation and recommendation formulation.

T8 Intellectual property concepts encompassing:

- Intellectual Property and Australian Law - The place of Intellectual Property in Australian Law; Past cases and outcomes; Necessary considerations and the like.
- The nature of Intellectual Property - What is Intellectual Property? What isn’t Intellectual Property?; Why is Intellectual Property relevant?; What can Intellectual Property rights do?; What can’t Intellectual Property rights do?
- Intellectual Property Rights - Patents; Copyright; Designs; Confidential Information; Other specialty rights and the like.
- Managing Intellectual Property - Identifying Intellectual Property; Deciding what to protect; Strategies for managing Intellectual Property; How can Intellectual Property rights work together?; Intellectual Property versus time, effort, finances; Sources of Assistance, including Publications, Intellectual Property professionals, Lawyers, Business Advisors, Marketing consultants and the like.
- Enforcement of Intellectual Property - The enforcement process; The role of lawyers; Resolution.
- The changing face of Intellectual Property - Development of Intellectual Property Right Laws; Changes to Intellectual Property Right laws; Extensions of Intellectual Property Rights into non-traditional areas, including cultural, property

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REQUIRED SKILLS AND KNOWLEDGE

arenas; The global marketplace and the like.

T9 Occupational Health and Safety principles and fundamentals encompassing:

- underlying principles of OH&S
- general aims and objectives of the relevant state or territory legislation relating to OH&S.
- employer and employee responsibilities, rights and obligations.
- major functions of safety committees and representatives.
- powers given to Occupational Health and Safety Inspectors
- housekeeping and potential hazards in relation to improper housekeeping
- selecting appropriate personal protective equipment (PPE) given hazardous situations

T10 The work environment encompassing:

- typical hazards associated with a range of work environments
- procedures used to control the risks associated with these hazards
- principles of risk assessment / management and state the purpose of each.
- hierarchy of OH&S hazard control measures.
- required documentation for risk assessment.
- commonly used workplace safety signs.
- workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
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EVIDENCE GUIDE

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EVIDENCE GUIDE

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BSXFM1504A	Participate in, lead and facilitate work teams
UEENEER001B	Contribute to the planning of a research project
UEENEER002B	Conduct to the conduct of a research project

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EVIDENCE GUIDE

UEENEER004B	Contribute to the trial of a product/application/service
UEENEER005B	Contribute to intellectual property management
BSBCMN306A	Produce business documents
BSBSBM405A	Monitor and manage business operations
UEENEER006B	Contribute to the commercialisation of a product/application/service
PMBQUAL309A	Solve problems using 'quality tools'

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit describes work conducted by technical personnel who contribute to the development of a product/application/service.

Product/application/service design and development briefs may be provided by external and/or internal clients.

Typically the work covered by this unit is performed by high-level technicians, working as part of a product/application/service research and/or design, development and implementation team. This generally involves working closely with a range of management and production/operations personnel and requires balancing the business and technical sides of the product/application/service being developed.

This unit does not require knowledge of industry sectors, equipment and/or materials other than that in which the learner works. It assumes an understanding of the operation of all relevant business processes but does not necessarily require them to be the responsibility of the learner.

At this level, personnel should be able to interpret and explain sections/types of legislation, codes, regulations, Australian Standards and Intellectual Property rights that apply to the subject matter to be researched.

This unit should be demonstrated in accordance with the organisation's:

- Occupational Health and Safety and Workplace Safety policies and procedures
- Goals, values, objectives, plans, systems and processes
- Business and performance plans
- Ethical standards
- Client service standards
- Quality and continuous improvement processes and standards
- Resources, which may be subject to negotiation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'.

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5)**

Research

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UEENEER004B Contribute to the trial of a product/application/ service

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the ability to assist the manager's plan, coordinate and report on a product/application/service trial.

Application of the Unit

Application of the Unit **4**)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Acquire and understand background information relevant to the trial of the product/application/service.	1.1	Information sources about the research topic are identified and evaluated for reliability and validity.
	1.2	Information about the consumer, product, market and competition is collected, reviewed and understood.
	1.3	Key clients/stakeholders and their particular views and interests are identified and recorded.
	1.4	The context (industrial, legal, ethical, political etc) of the research project is identified and understood.
2 Understand the logistics of a trial of a product, application and/or service	2.1	Client, stakeholder and organisational requirements are identified and understood.
	2.2	Contractual obligations of the project are identified and understood.
	2.3	Resources available to support the project are identified and understood.
	2.4	Quality standards for the project are identified and understood.
3 Contribute to the trial of a product, application and/or service	3.1	Project objectives, methodology and strategies appropriate to the requirements and contractual obligations of the project are identified and selected in a team environment.
	3.2	Project phases, milestones, reporting and review points are identified in a team environment.
	3.3	Criteria for evaluating each project deliverable against predefined quality standards are developed in a team environment.
	3.4	A Research Plan is developed in a team environment.

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ELEMENT	PERFORMANCE CRITERIA	
4 Seek endorsement and ensure distribution of a trial of a product, application and/or service	4.1	The draft Research Plan is forwarded to clients/stakeholders/ appropriate personnel for perusal and comment.
	4.2	The draft Research Plan is amended to incorporate recommended improvements from clients/stakeholders/appropriate personnel
	4.3	The final Research Plan is confirmed against overall project deliverables by appropriate personnel.
	4.4	The final Research Plan is distributed to all appropriate personnel and team members.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the trial of a product/application/service.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ER004B Product/application/service trials

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the trial of a product/application/service.

T1 Project planning

- Purpose of project planning
- Documents needed to plan a project
- Factors influencing sequence and restraints of project activities
- Critical path analysis encompassing:
  - Graphical representation methods
  - Methods of representing time/rates

T2 Research concepts encompassing:

- Terminology - Terminology used in a research workplace; Terminology used in research-specific literature and the like.
- Theory – why conduct research, The history of research; Past research successes; Past research failures; Research Protocols; Research practices and the like.
- The research environment - The research work environment; Standard research practices; Industrial, legal, ethical, political and market environment considerations; Legislation and regulation; Contractual obligations of all parties and the like.
- Planning to conduct research - Concept development and/or research brief analysis; Research objectives; Research deliverables; Research project plan; Literature reviews; Methodology development, including; Experimental design, Technology selection, Information Management system selection and the like
- Clients - Identifying client viewpoints and stake in project; Identifying client requirements and parameters; Determining research budgets, timelines, milestones and quality attributes with clients.
- Research, Development and Commercialisation - Research and Development goals versus Commercialisation goals and realities; Research and Development to inspire a commercialisation process.

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REQUIRED SKILLS AND KNOWLEDGE

T3 Work in a team encompassing:

- Types of teams - Managerial, Administrative, Project-based, Commercial and Social
- Roles, responsibilities and accountabilities of team members - the role, responsibility and accountability of individuals, teams, organisational management, clients and the like.
- Working in a team - Identification and utilisation of team member skills and knowledge; Maximising benefits of team diversity; Team planning; Team commitment and cooperation; Improving/Maximising team performance to achieve goals; Team monitoring and adjustment; Plain English literacy and communication; Leading, facilitating, participating, coaching, mentoring.
- Working with clients - client relations, client liaison, the practice of working with clients and the like.
- Conflict resolution – Personality analysis tools, Strategies for dealing with difficult people and the like.

T4 Scientific writing and communication encompassing:

- Types of scientific writing and communication - The distinguishing characteristics of the different types of scientific writing.
- Purpose of the different types of scientific writing - Product development justification and specifications; Management advice; Scientific papers/publications; Conference/meeting presentations; Policy documents; Planning documents; Reports and the like.
- Types of audience - The features and characteristics of an audience, including; an audience's professional, social, cultural, ethnic background and physical and academic capabilities; the importance of 'Plain English' written and oral communication.
- Scientific writing techniques - The component parts of scientific documents, including: Aim, Materials, Method, Results, Discussion, Conclusion, References; The required content of each component part; Scientific referencing techniques, including: Bibliographies, Reference Lists, Citations, Footnotes, Quotes, and Acknowledgements; Scientific labelling techniques, including: Graphs, Tables, Diagrams, and Figures; Techniques for documenting results, including: Text, Graphs, Tables, Diagrams, and Figures; Organisational standards for document and presentation production, including: Standard organisational document templates, letterheads, headers, footers, and logos.
- Oral communication techniques - Techniques for communicating to large groups, including; Conference presentations, Speeches; Techniques for communicating to small groups, including: Meeting presentations, Team discussions, planning forums and the like.
- Electronic communication formats - World-wide Web – protocols and practices; Email – protocols and practices; Transfer of information via CD Rom/Floppy Disk; Use of PDF and other secure files.
- Confidentiality considerations - Confidentiality practices to protect the

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REQUIRED SKILLS AND KNOWLEDGE

organisation; Confidentiality practices to protect the client; Confidentiality practices to protect providers of information/research cohorts.

T5 Data collection techniques encompassing:

- Data types - Quantitative data, including; empirical, non-parametric, parametric; Qualitative data; Raw; Graphic; Diagrams; Original; Textual; Multimedia; Electronic and the like.
- Data Collection - Data sources; Consultation protocols and practices; Survey methodologies, including; interviews, surveys, chat rooms, focus groups; Literature reviews, including; traditional and web-based; Group facilitation and presentation; Questioning, active listening and clarification; Obstacles to data collection, including; unavailable data, inconsistent data, confidentiality, security; Data limitations.
- Evaluating data quality - Reliability; Accuracy; Clarity; Validity; Contribution to research; Relevance to research objectives.

T6 Data analysis and presentation encompassing:

- Data analysis techniques - Univariate analysis; Multivariate analysis; Decision trees; Genetic Algorithms; Neural Networks; Gap Analysis; Urgency and impact, and the like.
- Data analysis technique selection - Determining the correct analysis technique(s); Determining the correct sequence of analysis techniques; Accommodating influencing factors including research objectives, budget, timeline and quality requirements, data limitations, confidentiality, security and the like.
- Data interpretation - Determining results; determining conclusions; Benchmarking; Quality Assurance, including consideration of accuracy, validity, clarity and the like.
- Data presentation:
  - Determining the correct form of presentation for the audience, including; colleagues, scientific community, marketing and commercialisation specialists, general community, industry, mixed (i.e. conference audience).
  - Forms of documentary presentation, including reports, journal articles, scientific papers, graphs, tables, diagrams, electronic formats; Forms of verbal presentation, including meetings, client briefings, conferences, support of a new concept, need for further research, commercialisation opportunity; Quality Assurance, including accuracy, validity, clarity of information presented.

T7 Product development and trials encompassing:

- Identifying client and managerial requirements for production and trials - Required outcome(s); Key performance indicators; Timelines; Financing; Resources; Quality Assurance and the like.
- Influencing factors - Internal business goals and strategies; Technical specifications (chemical, mechanical, environmental); Industrial considerations; Regulatory considerations; Legislative considerations; Intellectual Property; Australian & International Standards; Codes of Practice; Market requirements;

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REQUIRED SKILLS AND KNOWLEDGE

Resource requirements, including personnel tools and equipment (principles and practices), materials, finances and the like.Product development arrangements - Licensing agreements; Joint Ventures; Sole Ventures and the like.

- Relevant Documentation - Codes of Practice; Standard Operating Procedures; Product formulation documentation; Material safety data sheets (MSDSs); Equipment and Quality manuals; Calibration and maintenance schedules; Enterprise recording and reporting procedures; Material, equipment and product specifications and the like.
- Development & trial processes - Proof of concept; Trialing concepts; Definitions/Specifications; Types of development and trial processes, including Phase A product and trial, Phase B product and trial, User trials, Ergonomics and Usability testing; Pre-defined acceptance criteria, confidence limits; Data collection & analysis; Production; Evaluation and recommendation formulation.

T8 Intellectual property concepts encompassing:

- Intellectual Property and Australian Law - The place of Intellectual Property in Australian Law; Past cases and outcomes; Necessary considerations and the like.
- The nature of Intellectual Property - What is Intellectual Property? What isn't Intellectual Property?; Why is Intellectual Property relevant?; What can Intellectual Property rights do?; What can't Intellectual Property rights do?
- Intellectual Property Rights - Patents; Copyright; Designs; Confidential Information; Other specialty rights and the like.
- Managing Intellectual Property - Identifying Intellectual Property; Deciding what to protect; Strategies for managing Intellectual Property; How can Intellectual Property rights work together?; Intellectual Property versus time, effort, finances; Sources of Assistance, including Publications, Intellectual Property professionals, Lawyers, Business Advisors, Marketing consultants and the like.
- Enforcement of Intellectual Property - The enforcement process; The role of lawyers; Resolution.
- The changing face of Intellectual Property - Development of Intellectual Property Right Laws; Changes to Intellectual Property Right laws; Extensions of Intellectual Property Rights into non-traditional areas, including cultural, property arenas; The global marketplace and the like.

T9 Occupational Health and Safety principles and fundamentals encompassing:

- underlying principles of OH&S
- general aims and objectives of the relevant state or territory legislation relating to OH&S.
- employer and employee responsibilities, rights and obligations.
- major functions of safety committees and representatives.
- powers given to Occupational Health and Safety Inspectors
- housekeeping and potential hazards in relation to improper housekeeping
- selecting appropriate personal protective equipment (PPE) given hazardous situations

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REQUIRED SKILLS AND KNOWLEDGE

T10 The work environment encompassing:

- typical hazards associated with a range of work environments
- procedures used to control the risks associated with these hazards
- principles of risk assessment / management and state the purpose of each.
- hierarchy of OH&S hazard control measures.
- required documentation for risk assessment.
- commonly used workplace safety signs.
- workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
- appropriate fire extinguisher for a given type of fire.
- requirements for the location, mounting and maintenance of portable fire extinguishers.
- basic process of fighting a fire.
- safe premises, buildings and security are important in an industrial setting and the consequences of non- compliance with these.
- standard work procedure is and why they are required in some circumstances.

T11 Manual Handling encompassing:

- typical manual handling injuries and the effect they can have on lifestyle
- situations that may cause manual handling injuries
- correct procedures for lifting and carrying to prevent manual handling injuries
- Chemicals in the workplace encompassing:
- hazardous substances and dangerous goods.
- Classification of chemicals as hazardous substances and/or dangerous goods
- requirements for labelling of chemicals in the workplace
- safe storage procedures for chemicals
- purpose of and interpretation of material safety data sheet (MSDS)

T12 Working at heights encompassing:

- dangers associated with working on ladders and scaffolds
- identification of work area as a height risk and use appropriate safety equipment to prevent a fall
- selecting an appropriate ladder for a given situation and perform a safety check before use
- precautions that should be taken when ascending and working off a ladder
- precautions that should be taken when working on and around a scaffold and elevated platforms.

T13 Confined spaces encompassing:

- hazards associated with working in a confined space
- identifying workplace situations that could be classified as a confined space
- control measures for working in a designated confined space

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REQUIRED SKILLS AND KNOWLEDGE

T14 Physical and psychological hazards encompassing:

- short and long term effects of excessive noise and techniques to avoid damage to hearing due to excessive noise
- effects of vibration on the human body and work practices to protect against vibration
- effects of thermal stress on the human body and work practices to protect against thermal stress
- effects of ultraviolet (UV) radiation on the human body and work practices to protect against UV radiation.
- dangers associated with laser operated equipment and tools and suitable protective measures to overcome the danger.
- occupational overuse syndrome, state examples of how it occurs and describe means to overcome it
- factors that cause stress in the workplace, symptoms of a person suffering from stress and personal stress management techniques
- detrimental effects and dangers of drug and alcohol use in the workplace

T15 Working safely with electricity encompassing:

- effects of electric shock on the human body
- common causes of electrical accidents
- precautions that can minimise the chance of electric shock (earthing, extra low voltage, fuses, circuit breakers and residual current devices – RCDs)
- protection offered by a residual current device (RCD)
- need for ensuring the (safe) isolation of an electrical supply
- appropriate method of removing an electric shock victim from a live electrical situation

T16 Life support - CPR in the workplace encompassing:

- First Aid.
- responsibilities of the First Aider.
- priorities of first aid management for any accident or injury.
- procedures required at an accident scene.
- legal and ethical issues, which may impact on the management of care.
- 'Duty of Care'.
- examination of a casualty for injuries.
- effect of cardio pulmonary arrest on the body.
- Managing simulated conditions of: airway obstruction; respiratory arrest and cardio pulmonary arrest,
- single and two-person cardio pulmonary resuscitation (CPR).
- signs and symptoms of an altered level of consciousness
- management of simulation of a casualty with an altered level of consciousness.
- signs and symptoms of shock.

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REQUIRED SKILLS AND KNOWLEDGE

- management of simulation of a casualty in shock

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It shall be used in conjunction with all components parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These

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EVIDENCE GUIDE

points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Contribute to the trial of a product/application/service as described in 8) and including:

    A Demonstrating consistent performance for each Element of the unit

    B Meeting the performance criteria associated with

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each Element of the unit by employing techniques, procedures, information and resources available in the workplace

C Demonstrating an understanding of the Underpinning Knowledge and Skills identified in the section of this unit titled 'Essential knowledge and associated skills'.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to contributing to the trial of a product/application/service.

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EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

BSXFM1504A	Participate in, lead and facilitate work teams
UEENEER001B	Contribute to the planning of a research project
UEENEER002B	Conduct to the conduct of a research project
UEENEER004B	Contribute to the trial of a product/application/service
UEENEER005B	Contribute to intellectual property management
BSBCMN306A	Produce business documents
BSBSBM405A	Monitor and manage business operations
UEENEER006B	Contribute to the commercialisation of a product/application/service
PMBQUAL309A	Solve problems using 'quality tools'

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit describes work conducted by technical personnel who contribute to the trial and, where necessary, retrial of products, applications and/or services to meet the requirements of a development brief.

Product/application/service design and development briefs may be provided by external and/or internal clients.

Typically the work covered by this unit is performed by high-level technicians, working as part of a product/application/service research and/or design, development and implementation team. This generally involves working closely with a range of management and production/operations personnel and requires balancing the business and technical sides of the product/application/service being developed.

This unit does not require knowledge of industry sectors, equipment and/or materials other than that in which the learner works. It assumes an understanding of the operation of all relevant business processes but does not necessarily require them to be the responsibility of the learner.

At this level, personnel should be able to interpret and explain those sections of legislation, codes, regulations, Australian Standards and Intellectual Property rights that apply to the tasks undertaken in trailing products/applications/services. They should be aware of enterprise business goals and the impact of trials on these goals.

This unit should be demonstrated in accordance with the organisation's:

- Occupational Health and Safety and Workplace Safety policies and procedures
- Goals, values, objectives, plans, systems and processes
- Business and performance plans
- Ethical standards
- Client service standards
- Quality and continuous improvement processes and standards
- Resources, which may be subject to negotiation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'.

Reading	5	Writing	5	Numeracy	5

2.2) Literacy and numeracy skills

Competency Field **5)**

Research

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UEENEER005B Contribute to intellectual property management

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the ability to assist in the planning, management and protection of an organisation's Intellectual Property.

Application of the Unit

Application of the Unit **4**)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Plan for the management of intellectual property within the organisation	1.1	The types of Intellectual Property residing within the organization are identified.
	1.2	Sections of the organisation in which Intellectual Property management is required are identified.
	1.3	Intellectual Property rights appropriate to the types of Intellectual Property within the organization are identified.
	1.4	Intellectual Property rights of other like organizations are identified.
	1.5	An organisational Intellectual Property Management Plan, consistent with the organisation's Business Plan, is developed/amended.
	1.6	Approval of the new/amended Intellectual Property Management Plan is sought from relevant personnel.
2 Contribute to the management of intellectual property within the organisation	2.1	A new/amended Intellectual Property Management Plan within the organization is implemented.
	2.2	Documentation, deeds, registration certificates etc related to the organisation's Intellectual Property assets are managed.
	2.3	Intellectual Property management systems and structures, eg registrations, are monitored to ensure they are valid and working correctly.
	2.4	Evidence supporting the organisation's entitlement to exercise its Intellectual Property rights is collected, stored and maintained.
3 Contribute to protection of the organisation's Intellectual Property.	3.1	Sources of assistance in regard to the protection of the organisation's Intellectual Property are identified.
	3.2	Networks and professional relationships beneficial to the protection of the organisation's Intellectual Property are established and

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ELEMENT	PERFORMANCE CRITERIA
	maintained.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and contributing to Intellectual Property Management.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ER005B Intellectual Property Management

Evidence shall show that knowledge has been acquired of safe working practices and contributing to Intellectual Property Management.

T1 Project planning

- Purpose of project planning
- Documents needed to plan a project
- Factors influencing sequence and restraints of project activities
- Critical path analysis encompassing:
  - Graphical representation methods
  - Methods of representing time/rates

T2 Work in a team encompassing:

- Types of teams - Managerial, Administrative, Project-based, Commercial and Social
- Roles, responsibilities and accountabilities of team members - the role, responsibility and accountability of individuals, teams, organisational management, clients and the like.
- Working in a team - Identification and utilisation of team member skills and knowledge; Maximising benefits of team diversity; Team planning; Team commitment and cooperation; Improving/Maximising team performance to achieve goals; Team monitoring and adjustment; Plain English literacy and communication; Leading, facilitating, participating, coaching, mentoring.
- Working with clients - client relations, client liaison, the practice of working with clients and the like.
- Conflict resolution – Personality analysis tools, Strategies for dealing with difficult people and the like.

T3 Intellectual property concepts encompassing:

- Intellectual Property and Australian Law - The place of Intellectual Property in Australian Law; Past cases and outcomes; Necessary considerations and the like.
- The nature of Intellectual Property - What is Intellectual Property? What isn’t

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REQUIRED SKILLS AND KNOWLEDGE

Intellectual Property?; Why is Intellectual Property relevant?; What can Intellectual Property rights do?; What can't Intellectual Property rights do?

- Intellectual Property Rights - Patents; Copyright; Designs; Confidential Information; Other specialty rights and the like.
- Managing Intellectual Property - Identifying Intellectual Property; Deciding what to protect; Strategies for managing Intellectual Property; How can Intellectual Property rights work together?; Intellectual Property versus time, effort, finances; Sources of Assistance, including Publications, Intellectual Property professionals, Lawyers, Business Advisors, Marketing consultants and the like.
- Enforcement of Intellectual Property - The enforcement process; The role of lawyers; Resolution.
- The changing face of Intellectual Property - Development of Intellectual Property Right Laws; Changes to Intellectual Property Right laws; Extensions of Intellectual Property Rights into non-traditional areas, including cultural, property arenas; The global marketplace and the like.

T4 Occupational Health and Safety principles and fundamentals encompassing:

- underlying principles of OH&S
- general aims and objectives of the relevant state or territory legislation relating to OH&S.
- employer and employee responsibilities, rights and obligations.
- major functions of safety committees and representatives.
- powers given to Occupational Health and Safety Inspectors
- housekeeping and potential hazards in relation to improper housekeeping
- selecting appropriate personal protective equipment (PPE) given hazardous situations

T5 The work environment encompassing:

- typical hazards associated with a range of work environments
- procedures used to control the risks associated with these hazards
- principles of risk assessment / management and state the purpose of each.
- hierarchy of OH&S hazard control measures.
- required documentation for risk assessment.
- commonly used workplace safety signs.
- workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
- appropriate fire extinguisher for a given type of fire.
- requirements for the location, mounting and maintenance of portable fire extinguishers.
- basic process of fighting a fire.
- safe premises, buildings and security are important in an industrial setting and the consequences of non- compliance with these.
- standard work procedure is and why they are required in some circumstances.

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REQUIRED SKILLS AND KNOWLEDGE

T6 Manual Handling encompassing:

- typical manual handling injuries and the effect they can have on lifestyle
- situations that may cause manual handling injuries
- correct procedures for lifting and carrying to prevent manual handling injuries
- Chemicals in the workplace encompassing:
- hazardous substances and dangerous goods.
- Classification of chemicals as hazardous substances and/or dangerous goods
- requirements for labelling of chemicals in the workplace
- safe storage procedures for chemicals
- purpose of and interpretation of material safety data sheet (MSDS)

T7 Working at heights encompassing:

- dangers associated with working on ladders and scaffolds
- identification of work area as a height risk and use appropriate safety equipment to prevent a fall
- selecting an appropriate ladder for a given situation and perform a safety check before use
- precautions that should be taken when ascending and working off a ladder
- precautions that should be taken when working on and around a scaffold and elevated platforms.

T8 Confined spaces encompassing:

- hazards associated with working in a confined space
- identifying workplace situations that could be classified as a confined space
- control measures for working in a designated confined space

T9 Physical and psychological hazards encompassing:

- short and long term effects of excessive noise and techniques to avoid damage to hearing due to excessive noise
- effects of vibration on the human body and work practices to protect against vibration
- effects of thermal stress on the human body and work practices to protect against thermal stress
- effects of ultraviolet (UV) radiation on the human body and work practices to protect against UV radiation.
- dangers associated with laser operated equipment and tools and suitable protective measures to overcome the danger.
- occupational overuse syndrome, state examples of how it occurs and describe means to overcome it
- factors that cause stress in the workplace, symptoms of a person suffering from stress and personal stress management techniques
- detrimental effects and dangers of drug and alcohol use in the workplace

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REQUIRED SKILLS AND KNOWLEDGE

T10 Working safely with electricity encompassing:

- effects of electric shock on the human body
- common causes of electrical accidents
- precautions that can minimise the chance of electric shock (earthing, extra low voltage, fuses, circuit breakers and residual current devices – RCDs)
- protection offered by a residual current device (RCD)
- need for ensuring the (safe) isolation of an electrical supply
- appropriate method of removing an electric shock victim from a live electrical situation

T11 Life support - CPR in the workplace encompassing:

- First Aid.
- responsibilities of the First Aider.
- priorities of first aid management for any accident or injury.
- procedures required at an accident scene.
- legal and ethical issues, which may impact on the management of care.
- 'Duty of Care'.
- examination of a casualty for injuries.
- effect of cardio pulmonary arrest on the body.
- Managing simulated conditions of: airway obstruction; respiratory arrest and cardio pulmonary arrest,
- single and two-person cardio pulmonary resuscitation (CPR).
- signs and symptoms of an altered level of consciousness
- management of simulation of a casualty with an altered level of consciousness.
- signs and symptoms of shock.
- management of simulation of a casualty in shock

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It shall be used in conjunction with all components parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment	**9**.**1**) Longitudinal competency development approaches to

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EVIDENCE GUIDE

assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.**2**)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

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EVIDENCE GUIDE

shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Contribute to Intellectual Property Management as described in 8) and including:

    A Demonstrating consistent performance for each Element of the unit

    B Meeting the performance criteria associated with each Element of the unit by employing techniques, procedures, information and resources available in the workplace

    C Demonstrating an understanding of the Underpinning Knowledge and Skills identified in the section of this unit titled 'Essential knowledge and associated skills'.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to contributing to Intellectual Property Management.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

BSXFM1504A	Participate in, lead and facilitate work teams
UEENEER001B	Contribute to the planning of a research project
UEENEER002B	Conduct to the conduct of a research project

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EVIDENCE GUIDE

UEENEER003B	Contribute to the development of a product/application/service
UEENEER004B	Contribute to the trial of a product/application/service
BSBCMN306A	Produce business documents
BSBSBM405A	Monitor and manage business operations
UEENEER006B	Contribute to the commercialisation of a product/application/service
PMBQUAL309A	Solve problems using 'quality tools'

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit describes work conducted by technical personnel who contribute to the planning and conduct of research and/or development and/or trialling of products, applications and/or services and require knowledge and skills in Intellectual Property management in order complete these roles efficiently and effectively.

Typically the work covered by this unit is performed by high-level technicians, working as part of a product/application/service research and/or design, development and implementation team. This generally involves working closely with a range of management and production/operations personnel and requires balancing the business and technical sides of the product/application/service being researched, developed, trialled and/or commercialised.

This unit does not require knowledge of industry sectors, equipment and/or materials other than that in which the learner works. It assumes an understanding of the operation of all relevant business processes but does not necessarily require them to be the responsibility of the learner.

At this level, personnel should be able to interpret and explain those sections of legislation, codes, regulations, Australian Standards and Intellectual Property rights that apply to the research, development and, where appropriate, commercialisation of a product/application/service.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

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Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'.

Reading	5	Writing	5	Numeracy	5

Custom Content Section

Competency Field **5)**

Research

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UEENEER006B Contribute to the commercialisation of products/applications/ services

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers the ability to assist managers identify and investigate opportunities for commercialisation within the organisation, commercialise a product, application or service and critically assess the commercialisation process.

Application of the Unit

Application of the Unit **4**)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

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Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a licence to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Contribute to the identification and investigation of commercialisation opportunities.	1.1	Commercialisation opportunities are identified and analysed in terms of their likely fit with the organisation's goals.
	1.2	Each opportunity is evaluated to determine its impact on current business and customer base.
	1.3	An assessment of external factors, costs, benefits, risks, market opportunities and potential competitors is undertaken to determine the potential viability of each opportunity.
	1.4	Probable return on investment is determined.
	1.5	A design brief for the product/application/service is developed in a team environment.
	1.6	Approval for the design brief is obtained from appropriate personnel.
2 Prepare to develop a product/ application/service	2.1	Required outcome(s), as identified in design brief, with appropriate personnel are confirmed.
	2.2	Product/application/service is developed in consultation with appropriate production personnel.
	2.3	A development procedure is formulated to: - deliver required quality outcome(s); - ensure OHS, environmental, industrial and regulatory requirements are stringently observed; - ensure tooling, process, materials and equipment specifications are addressed
	2.4	Approval of the development procedure is obtained from appropriate personnel.
3 Contribute to the development of a product/application/service.	3.1	The development procedure is confirmed with appropriate personnel.
	3.2	Assist in coordinating the development of a product/application/ service product, in accordance with the design brief and development procedure.

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ELEMENT	PERFORMANCE CRITERIA	
	3.3	Development results in accordance with enterprise procedures are recorded.
	3.4	Development results and characteristics which are outside design and development specifications are analysed and identified.
	3.5	Changes are recommended, as necessary, to achieve product/application/ service quality and production requirements.
	3.6	Approval of changes is obtained from appropriate personnel.
	3.7	The product/ application/service is revised, where necessary, to achieve quality and production requirements.
4 Document and report product/application/service development outcomes.	4.1	All product/application/service development objectives are met.
	4.2	Product/application/service development reporting requirements are completed.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the commercialisation of products/applications/ services.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-ER006B Products/applications/ services commercialisation.

Evidence shall show that knowledge has been acquired of safe working practices and contributing to the commercialisation of products/applications/ services.

T1 Work in a team encompassing:

- Types of teams - Managerial, Administrative, Project-based, Commercial and Social
- Roles, responsibilities and accountabilities of team members - the role, responsibility and accountability of individuals, teams, organisational management, clients and the like.
- Working in a team - Identification and utilisation of team member skills and knowledge; Maximising benefits of team diversity; Team planning; Team commitment and cooperation; Improving/Maximising team performance to achieve goals; Team monitoring and adjustment; Plain English literacy and communication; Leading, facilitating, participating, coaching, mentoring.
- Working with clients - client relations, client liaison, the practice of working with clients and the like.
- Conflict resolution – Personality analysis tools, Strategies for dealing with difficult people and the like.

T2 Intellectual property concepts encompassing:

- Intellectual Property and Australian Law - The place of Intellectual Property in Australian Law; Past cases and outcomes; Necessary considerations and the like.
- The nature of Intellectual Property - What is Intellectual Property? What isn’t Intellectual Property?; Why is Intellectual Property relevant?; What can Intellectual Property rights do?; What can’t Intellectual Property rights do?
- Intellectual Property Rights - Patents; Copyright; Designs; Confidential Information; Other specialty rights and the like.
- Managing Intellectual Property - Identifying Intellectual Property; Deciding what to protect; Strategies for managing Intellectual Property; How can Intellectual Property rights work together?; Intellectual Property versus time, effort, finances; Sources of Assistance, including Publications, Intellectual Property professionals,

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REQUIRED SKILLS AND KNOWLEDGE

Lawyers, Business Advisors, Marketing consultants and the like.

- Enforcement of Intellectual Property - The enforcement process; The role of lawyers; Resolution.
- The changing face of Intellectual Property - Development of Intellectual Property Right Laws; Changes to Intellectual Property Right laws; Extensions of Intellectual Property Rights into non-traditional areas, including cultural, property arenas; The global marketplace and the like.

T3 Commercialisation concepts encompassing:

- Commercialisation - Definition of commercialisation; Triggers for commercialisation; Past commercialisation successes; Past commercialisation failures; Triggers for commercialisation; Methods for identifying a good product/idea/service/application; Sources of assistance in regard to commercialisation, including documents; lawyers, business advisors, marketing consultants.
- The commercialisation process - The concept; Does the concept fit with the organisation's goals? Is there a market, what is the market? Will the product meet the market requirements? Can the product be sold? How can the product be sold? Can the product be produced? How can the product be produced? Can the production be repeated?
- Commercialisation arrangements - sole venture; Joint venture; Licensing; Legal aspects of commercialisation.
- Commercialisation planning - Costing; Marketing; Production/development; Distribution; Sales.
- Competition - Who are the competitors? What are they doing and how quickly? Internal development relevant to competition.
- Critical analysis of the commercialisation process for continuous improvement - Successes; Opportunities for improvement; Controllable influences; Uncontrollable influences; Formulation of recommendations.

T4 Occupational Health and Safety principles and fundamentals encompassing:

- underlying principles of OH&S
- general aims and objectives of the relevant state or territory legislation relating to OH&S.
- employer and employee responsibilities, rights and obligations.
- major functions of safety committees and representatives.
- powers given to Occupational Health and Safety Inspectors
- housekeeping and potential hazards in relation to improper housekeeping
- selecting appropriate personal protective equipment (PPE) given hazardous situations

T5 The work environment encompassing:

- typical hazards associated with a range of work environments
- procedures used to control the risks associated with these hazards

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REQUIRED SKILLS AND KNOWLEDGE

- principles of risk assessment / management and state the purpose of each.
- hierarchy of OH&S hazard control measures.
- required documentation for risk assessment.
- commonly used workplace safety signs.
- workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
- appropriate fire extinguisher for a given type of fire.
- requirements for the location, mounting and maintenance of portable fire extinguishers.
- basic process of fighting a fire.
- safe premises, buildings and security are important in an industrial setting and the consequences of non- compliance with these.
- standard work procedure is and why they are required in some circumstances.

T6 Manual Handling encompassing:

- typical manual handling injuries and the effect they can have on lifestyle
- situations that may cause manual handling injuries
- correct procedures for lifting and carrying to prevent manual handling injuries
- Chemicals in the workplace encompassing:
- hazardous substances and dangerous goods.
- Classification of chemicals as hazardous substances and/or dangerous goods
- requirements for labelling of chemicals in the workplace
- safe storage procedures for chemicals
- purpose of and interpretation of material safety data sheet (MSDS)

T7 Working at heights encompassing:

- dangers associated with working on ladders and scaffolds
- identification of work area as a height risk and use appropriate safety equipment to prevent a fall
- selecting an appropriate ladder for a given situation and perform a safety check before use
- precautions that should be taken when ascending and working off a ladder
- precautions that should be taken when working on and around a scaffold and elevated platforms.

T8 Confined spaces encompassing:

- hazards associated with working in a confined space
- identifying workplace situations that could be classified as a confined space
- control measures for working in a designated confined space

T9 Physical and psychological hazards encompassing:

- short and long term effects of excessive noise and techniques to avoid damage to hearing due to excessive noise

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REQUIRED SKILLS AND KNOWLEDGE

- effects of vibration on the human body and work practices to protect against vibration
- effects of thermal stress on the human body and work practices to protect against thermal stress
- effects of ultraviolet (UV) radiation on the human body and work practices to protect against UV radiation.
- dangers associated with laser operated equipment and tools and suitable protective measures to overcome the danger.
- occupational overuse syndrome, state examples of how it occurs and describe means to overcome it
- factors that cause stress in the workplace, symptoms of a person suffering from stress and personal stress management techniques
- detrimental effects and dangers of drug and alcohol use in the workplace

T10 Working safely with electricity encompassing:

- effects of electric shock on the human body
- common causes of electrical accidents
- precautions that can minimise the chance of electric shock (earthing, extra low voltage, fuses, circuit breakers and residual current devices – RCDs)
- protection offered by a residual current device (RCD)
- need for ensuring the (safe) isolation of an electrical supply
- appropriate method of removing an electric shock victim from a live electrical situation

T11 Life support - CPR in the workplace encompassing:

- First Aid.
- responsibilities of the First Aider.
- priorities of first aid management for any accident or injury.
- procedures required at an accident scene.
- legal and ethical issues, which may impact on the management of care.
- 'Duty of Care'.
- examination of a casualty for injuries.
- effect of cardio pulmonary arrest on the body.
- Managing simulated conditions of: airway obstruction; respiratory arrest and cardio pulmonary arrest,
- single and two-person cardio pulmonary resuscitation (CPR).
- signs and symptoms of an altered level of consciousness
- management of simulation of a casualty with an altered level of consciousness.
- signs and symptoms of shock.
- management of simulation of a casualty in shock

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It shall be used in conjunction with all components parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.**1**)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of

9.**2**)

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EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Contribute to the commercialisation of products/applications/ services as described in 8) and including:

    A Demonstrating consistent performance for each Element of the unit

    B Meeting the performance criteria associated with each Element of the unit by employing techniques, procedures, information and resources available in the workplace

    C Demonstrating an understanding of the Underpinning Knowledge and Skills identified in

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EVIDENCE GUIDE

the section of this unit titled 'Essential knowledge and associated skills'.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to contributing to the commercialisation of products/applications/ services.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and

9.5)

For optimisation of training and assessment effort, competency

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EVIDENCE GUIDE

relationship with other units

development in this unit may be arranged concurrently with unit:

BSXFM1504A	Participate in, lead and facilitate work teams
UEENEER001B	Contribute to the planning of a research project
UEENEER002B	Conduct to the conduct of a research project
UEENEER003B	Contribute to the development of a product/application/service
UEENEER004B	Contribute to the trial of a product/application/service
UEENEER005B	Contribute to Intellectual Property management
BSBCMN306A	Produce business documents
BSBSBM405A	Monitor and manage business operations
PMBQUAL309A	Solve problems using 'quality tools'

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Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit describes work conducted by technical personnel who contribute to the development and where necessary, redevelopment of products, applications and/or services to meet the requirements of design and development briefs.

Product/application/service design and development briefs may be provided by external and/or internal clients.

Typically the work covered by this unit is performed by high-level technicians, working as part of a product/application/service research and/or design, development and implementation team which may or may not include a research component. This generally involves working closely with a range of management and production/operations personnel and requires balancing the business and technical sides of the product/application/service being developed.

This unit does not require knowledge of industry sectors, equipment and/or materials other than that in which the learner works. It assumes an understanding of the operation of all relevant business processes but does not necessarily require them to be the responsibility of the learner.

At this level, personnel should be able to interpret and explain those sections of legislation, codes, regulations, Australian Standards and Intellectual Property rights that apply to the tasks undertaken in developing products/applications/services. They should also be aware of enterprise business goals and the impact of their projects on these goals.

This unit should be demonstrated in accordance with the organisation's:

- Occupational Health and Safety and Workplace Safety policies and procedures
- Goals, values, objectives, plans, systems and processes
- Business and performance plans
- Ethical standards
- Client service standards
- Quality and continuous improvement processes and standards
- Resources, which may be subject to negotiation

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these

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RANGE STATEMENT

and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

Competency Field **5**)

Research

2.2) Literacy and numeracy skills

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'.

Reading	5	Writing	5	Numeracy	5

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BSBCUS401B Coordinate implementation of customer service strategies

Modification History

Release	Comments
Release 1	This version first released with *BSB07 Business Training Package version 6.0.* Revised unit. Performance criteria amended so that the learner is not required to 'incorporate evidence of customer satisfaction in decision to modify products or services'. Required skills updated to focus on learning and development practices and compliance with policy and procedures. Replaces BSBCUS401A Coordinate implementation of customer service strategies

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to advise on, carry out and evaluate customer service strategies, including the design of improvement strategies based on feedback. Operators may have responsibility to provide guidance or to delegate aspects of these tasks to others.

Application of the Unit

This unit applies to individuals with a broad knowledge of customer service strategies who contribute well developed skills in addressing customer needs and problems.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Element	**Performance Criteria**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.*

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Elements and Performance Criteria

1. Advise on customer service needs	1.1 Clarify and accurately assess ***customer needs*** using appropriate ***communication techniques*** 1.2 Diagnose problems matching service delivery to ***customers*** and develop options for improved service within ***organisational requirements*** 1.3 Provide relevant and constructive advice to promote the improvement of customer service delivery 1.4 Use ***business technology*** and/or ***online services*** to structure and present information on customer service needs
2. Support implementation of customer service strategies	2.1 Ensure customer service strategies and opportunities are promoted to ***designated individuals and groups*** 2.2 Identify and allocate available budget resources to fulfil customer service objectives 2.3 Promptly action ***procedures to resolve customer difficulties*** and ***complaints*** within organisational requirements 2.4 Ensure that decisions to implement ***strategies*** are taken in consultation with designated individuals and groups
3. Evaluate and report on customer service	3.1 Review client satisfaction with service delivery using verifiable data in accordance with organisational requirements 3.2 Identify and report changes necessary to maintain service standards to designated individuals and groups 3.3 Prepare conclusions and recommendations from verifiable evidence and provide constructive advice on future directions of client service strategies 3.4 Maintain systems, records and reporting procedures to compare changes in customer satisfaction

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to
  - communicate effectively with personnel and clients at all levels
  - articulate customer service strategies
- interpersonal skills to:
  - build relationships with customers
  - establish rapport
- literacy skills to:
  - prepare general information and papers
  - read a variety of texts
  - write formal and informal letters according to target audience
- planning skills to develop implementation schedules
- problem-solving skills to diagnose organisational problems relating to customer services
- self-management skills to:
  - comply with policies and procedures
  - consistently evaluate and monitor own performance
  - seek learning opportunities.

Required knowledge

- key provisions of relevant legislation from all levels of government that may affect aspects of business operations, such as:
  - anti-discrimination legislation
  - ethical principles
  - codes of practice
  - privacy laws
  - environmental issues
  - occupational health and safety (OHS)
- principles of customer service
- organisational business structure, products and services
- product and service standards and best practice models.

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • identifying needs and priorities of the organisation in delivering services to customers • responding to and reporting on customer feedback • designing strategies to improve delivery of products and services • knowledge of the principles of customer service.
Context of and specific resources for assessment	Assessment must ensure: • access to an actual workplace or simulated environment • access to office equipment and resources • examples of customer complaints, feedback and strategies.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • review of documentation reporting changes necessary to maintain service standards • analysis of responses to case studies and scenarios • demonstration of techniques • observation of presentations • oral or written questioning to assess knowledge of customer service techniques and strategies • review of systems, records and reporting procedures to compare changes in customer satisfaction.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Customer needs may relate to:	• accuracy of information • advice or general information • complaints • fairness/politeness • further information • making an appointment • prices/value • purchasing organisation's products and services • returning organisation's products and services • specific information.
Communication techniques may include:	• analysing customer satisfaction surveys • analysing quality assurance data • conducting interviews • consultation methods, techniques and protocols • making recommendations • obtaining management decisions • questioning • seeking feedback to confirm understanding • summarising and paraphrasing.
Customers may include:	• corporate customers • individual members of the organisation • individual members of the public • internal or external • other agencies.
Organisational requirements may include:	• access and equity principles and practice • anti-discrimination and related policy • confidentiality and security requirements • defined resource parameters • ethical standards • goals, objectives, plans, systems and processes • legal and organisational policies, guidelines and requirements • OHS policies, procedures and programs • payment and delivery options

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	• pricing and discount policies • quality and continuous improvement processes and standards • quality assurance and/or procedures manuals • replacement and refund policy and procedures • who is responsible for products or services.
Business technology may include:	• answering machine • binder • computer • fax machine • photocopier • printer • shredder • telephone.
Online services may include:	• access to product database by customers online • access to purchase, delivery and account records • contact centre • online ordering • online payments • online registration • quick/reasonable response • two-way communication online.
Designated individuals and groups may include:	• colleagues • committee • customers • external organisation • line management • supervisor.
Procedures to resolve customer difficulties may include:	• external agencies (e.g. Ombudsman) • item replacement • referrals to supervisor • refund of monies • review of products or services • using conflict management techniques.

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Customer complaints may include:	• administrative errors such as incorrect invoices or prices
	• customer satisfaction with service quality
	• damaged goods or goods not delivered
	• delivery errors
	• products not delivered on time
	• service errors
	• specific e-business problems and issues:
	  • difficulty accessing services
	  • inactive links
	  • not appreciating differing hardware and software
	  • services not available
	  • supply errors such as incorrect product delivered
	  • time taken to access services
	  • unfriendly website design
	  • website faults
	• warehouse or store room errors such as incorrect product delivered.

Customer service ***strategies*** may include:	• courtesy/politeness • delivery times • merchandise characteristics • price offers • product/refund guarantees • product/service availability.

Unit Sector(s)

Stakeholder Relations – Customer Service

Custom Content Section

Not applicable.

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BSBINM401A IMPLEMENT WORKPLACE INFORMATION SYSTEM

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to implement the workplace information system. It involves the identification, acquisition, initial analysis and use of appropriate information, which plays a significant part in the organisation's effectiveness. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	Frontline managers play a significant role in contributing to the organisation's effectiveness in identifying, acquiring, analysing and using appropriate information. At this level, work will normally be carried out within routine and non routine methods and procedures, which require planning and evaluation, leadership and guidance of others, and some discretion and judgement.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify and source information needs	1.1. Determine and locate ***information*** required by teams 1.2. Acquire and review information held by the organisation to determine suitability, accessibility, currency and reliability according to ***organisational policies***
2. Collect, analyse and report information	2.1. Collect information, which is adequate and relevant to the needs of teams, in a timely manner 2.2. Ensure information is in a format suitable for analysis, interpretation and dissemination 2.3. Analyse information to identify and report relevant trends and developments in terms of the needs for which it was acquired
3. Implement information systems	3.1. Implement management information systems effectively to store, retrieve and regularly review data for decision making purposes 3.2. Use ***technology*** available in the work area to manage information effectively 3.3. Submit recommendations for improving the information system to ***designated persons and/or groups***
4. Prepare for information system changes	4.1. Collect information about information system future needs in consultation with ***colleagues***, including those who have a specialist role in resource management 4.2. Ensure estimates of information system future needs reflect the organisation's ***business plans***, and customer and supplier requirements 4.3. Support proposals to secure resources by clearly presenting submissions that describe realistic options, benefits, costs and outcomes 4.4. Prepare team members to work with new technology and information system changes

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• literacy skills to work with information, and to research and present information in ways that are appropriate to the work team • technology skills to work with a range of information systems.
Required knowledge

• information management systems and technology that would be associated with the workplace such as:
  • budgets and financial management systems
  • customer information software or records
  • databases
  • personal digital assistant (PDA)
  • product and service information
  • project management software
  • record management systems
  • spreadsheets.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • analysis of the information that is required for the effective functioning of the team's work together • knowledge of the range of information systems that are, or should be, available in the workplace • ability to recognise what information system changes and improvements will be required in the future.
Context of and specific resources for assessment	Assessment must ensure: • access to appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • demonstration of techniques in working with information management systems • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • oral or written questioning to assess knowledge of relevant technology • review of documentation analysing information trends and developments • written reports on future information system needs • review of preparation undertaken for team members to work with new technology and information system changes.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other units from the Certificate IV in Frontline Management.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Information may include:	• archived, filed and historical background data • continuous improvement and quality assurance data • data available internally or externally • data shared and retrieved in various forms such as in writing or verbally, electronically or manually • financial and contractual data • marketing and customer-related data • organisational performance data • planning and organisational documents • policies and procedures
Organisational policies may include:	• guidelines for decision making throughout the organisation that link the formulation of strategy with its implementation • sets of accepted actions approved by the organisation • Standard Operating Procedures
Technology may include:	• computerised systems and software such as databases, project management and word processing • telecommunications devices • any other technology used to carry out work roles and responsibilities
Designated persons and/or groups may include:	• groups designated in workplace policies and procedures • managers or supervisors with management roles and responsibilities concerning information systems • other stakeholders accessing the information system such as customers and service providers • other work groups or teams whose work will be affected by the system

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RANGE STATEMENT	
Colleagues may include:	• employees at the same level or more senior managers • occupational health and safety committee members and other specialists • people from a range of social, cultural and ethnic backgrounds and with a range of physical and mental abilities • team members
Business plans may include:	• cash flow projections • long-term budgets/plans • operational plans • short-term budgets/plans • spreadsheet-based financial projections • targets or key performance indicators for production, productivity, wastage, sales, income and expenditure

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Management

Co-requisite units

Co-requisite units		

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BSBINM501A Manage an information or knowledge management system

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to organise learning to use an information or knowledge management system and to manage the use of the system. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit applies to managers who have responsibility for seeing that key information and corporate knowledge are retained, accessible to others and improve business outcomes. The unit does not address the requirement to select the technical system (software or hardware), which is seen as the role of an information technology specialist, although in some smaller organisations this may be a part of the manager's role.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Organise learning to use information or knowledge management system	1.1. Identify learning needs of ***relevant personnel*** and ***stakeholders*** for input into, and use of, ***an information or knowledge management system*** 1.2. Identify and secure human, financial and physical resources required for ***learning activities*** to use an information or knowledge management system 1.3. Organise and facilitate learning activities 1.4. Promote and support use of the system throughout the organisation 1.5. Monitor and document effectiveness of learning activities
2. Manage use of information or knowledge management system	2.1. Ensure implementation of ***policies and procedures for the information or knowledge management system*** are monitored for compliance, effectiveness and efficiency 2.2. Address implementation issues and problems as they arise 2.3. Monitor integration and alignment with data and information systems 2.4. Collect information on achievement of ***performance measures*** 2.5. Manage contingencies such as system failure or technical difficulties by accessing technical specialist help as required
3. Review use of information or knowledge management system	3.1. Analyse effectiveness of system and report on strengths and limitations of the system 3.2. Review business and operational plan and determine how effectively the system is contributing to intended outcomes 3.3. Make recommendations for improvement to system, policy or work practices

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical and problem-solving skills to ensure the system is working in accordance with organisational expectations and to deal with contingencies
- technology skills to work with and manage the use of the information or knowledge management system.

Required knowledge

- legislation, codes of practice and national standards, for example:
  - privacy and confidentiality legislation
  - freedom of information legislation
  - AS 5037:2005 Knowledge management - A guide
- organisational policies and procedures, for example:
  - records management
  - information management
  - customer service
  - commercial confidentiality
- organisational operations, and existing data and information systems.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • analysis of the strengths and weaknesses of information or knowledge management system/s and evaluation of suitability for a particular work or organisational context • knowledge of relevant legislation, codes of practice and national standards.
Context of and specific resources for assessment	Assessment must ensure: • access to system • access to system user feedback.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • assessment of written reports reviewing and evaluating information or knowledge management systems • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • observation of presentations • oral or written questioning to assess knowledge of relevant organisational policies and procedures • review of identified learning needs personnel and stakeholders regarding the information or knowledge management system • evaluation of monitoring and documentation about the effectiveness of learning activities • analysis documentation reporting on the strengths and limitations of the system • review of recommendations made for improvements to the system, policy or work practices.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended,

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EVIDENCE GUIDE	
	for example: • other units from the Diploma of Management.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant personnel include:	• managers, leaders, supervisors and coordinators • owners • staff, team members and colleagues
Stakeholders include:	• clients and customers • employee representatives • funding bodies • industry, professional and trade associations • regulatory bodies and authorities • sponsors • tenderers, suppliers and contractors
Information or knowledge management is defined as:	• equipment, strategies, methods, activities and techniques used formally and informally by individuals and the organisation to identify, collect, organise, store, retrieve, analyse, share and draw on information and knowledge valuable to the work of the organisation
An information or knowledge management system:	• comprises policies, protocols, procedures and practices to manage information or knowledge within the organisation and among relevant stakeholders
Learning activities include:	• coaching and mentoring programs • help desks • information sessions, briefings, workshops and training programs • paper-based or electronic (including intranet) learning opportunities • use of expert workers such as coaches and mentors to help other personnel use the system
Policies and procedures for the information or knowledge management system cover:	• complying with legislative requirements (such as privacy, confidentiality and defamation requirements) and other policies and procedures • content guidelines

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RANGE STATEMENT	
	• ensuring accuracy and relevance of knowledge input into the system • mechanisms, formats and styles of input to system, including appropriate alternative formats for people with a disability • permissions for input • removing out-of-date, inaccurate and content that is no longer relevant • selecting, maintaining and disposing of knowledge in the system • sharing knowledge in the system
Performance measures include:	• key performance indicators • other systems and measures to enable assessment of how, when, where and why outcomes are being achieved • performance objectives • performance standards (including codes of conduct) • qualitative or quantitative mechanisms to measure individual performance

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Management

Co-requisite units

Co-requisite units		

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BSBINN301A Promote innovation in a team environment

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to be an effective and pro active member of an innovative team. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit applies individuals who play a pro active role in demonstrating, encouraging or supporting innovation in a team environment. The individual may be a team participant or a team leader. The team may 'make itself' or be constructed by others. It may have core members and members who participate at certain times or for particular purposes. It may be permanent or temporary, or come together at different times to work on specific projects. The team could consist of a team of contractors/freelancers, permanent staff, clients and service providers, or any combination of these groups. It may operate within an organisation or across several organisations - or simply across a group of individuals. The key focus of the unit is on what makes for an innovative team, what keeps it working well, how the structure of work can make a difference and what skills and knowledge are needed to maximise opportunities for innovation. Where a greater focus on team leadership is required this unit should be combined with units such as BSBLED401A Develop teams and individuals.

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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Create opportunities to maximise innovation within the team	1.1. Evaluate and reflect on ***what the team needs and wants to achieve*** 1.2. Check out ***information about current or potential team members' work*** in the context of developing a more innovative team 1.3. Bring people into the team or make suggestions for team members based on what needs to be achieved and the potential for cross-fertilising ideas 1.4. Acknowledge, respect and discuss the ***different ways that different people may contribute*** to building or enhancing the team
2. Organise and agree effective ways of working	2.1. Jointly establish ***ground rules*** for how the team will operate 2.2. Agree and communicate responsibilities in ways that encourage and reinforce ***team-based innovation*** 2.3. Agree and share tasks and activities to ensure the best use of skills and abilities within the team 2.4. Plan and schedule activities to allow time for thinking, challenging and collaboration 2.5. Establish personal reward and stimulation as an integral part of the team's way of working
3. Support and guide colleagues	3.1. Model ***behaviour that supports innovation*** 3.2. Seek ***external stimuli and ideas*** to feed into team activities 3.3. Pro-actively share information, knowledge and experiences with other team members 3.4. Challenge and test ideas within the team in a positive and collaborative way 3.5. Pro-actively discuss and explore ideas with other team members on an ongoing basis
4. Reflect on how the team is working	4.1. De-brief and reflect on activities and on opportunities for improvement and innovation 4.2. Gather and use feedback from within and outside the team to generate discussion and debate 4.3. Discuss the ***challenges of being innovative*** in a constructive and open way 4.4. Take ideas for improvement, build them into future activities and communicate key issues to relevant colleagues 4.5. Identify, promote and celebrate successes and

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ELEMENT	PERFORMANCE CRITERIA
	examples of successful innovation

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to work collaboratively as part of a team, to provide guidance and support to others, and to participate in open and constructive discussions
- creative thinking skills to generate, explore, test and challenge ideas
- learning skills to stretch boundaries of own knowledge and skills
- literacy skills to analyse a wide range of information from varied sources
- planning and organisational skills to participate in the effective allocation of work in a team context
- problem-solving skills to work constructively to overcome issues and challenges of both a practical and conceptual nature and to make ideas become realities
- self-management skills to take a pro-active team role and to reflect on own performance in modelling and encouraging behaviour that supports innovation.

Required knowledge

- barriers to innovation that can occur within a team and broader barriers that sometimes hinder innovation
- broad concepts of innovation including what innovation is, different types of innovation and the benefits of innovation
- characteristics of teams that are more likely to be innovative and characteristics of broader environments that support and encourage innovation
- different roles that people may play within a team, how this impacts on the way a team works and what it might achieve
- group dynamics in a team.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • active participation in a team where the team takes a pro-active and considered approach to innovation and innovative practice • collaborative and open communication within the team • knowledge and understanding of the internal and external factors that contribute to a team becoming and remaining innovative.
Context of and specific resources for assessment	Assessment must ensure: • demonstration of skills as part of a team.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • direct observation of team interactions • evaluation of reports by the candidate or the team (could be oral or written) discussing the ideas, challenges and opportunities associated with teams, and how they can be more innovative • evaluation of feedback from other people in the team about the candidate's communication approaches and abilities • oral or written questioning to assess knowledge of the characteristics of innovative teams, innovation concepts more broadly and they ways in which innovation can be encouraged • review of jointly established 'groundrules' for how the team will operate.
Guidance information for assessment	Innovation does not occur in isolation. Holistic assessment with other units relevant to the industry sector, workplace and job role is highly recommended.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
What the team needs and wants to achieve may relate to:	• addressing particular customer feedback • conceiving and implementing a particular project • developing new services or products • generating ongoing ideas within the work unit • improving budgetary performance • improving or changing work conditions • new ideas that impact beyond the workplace (e.g. that have a broader social or community impact)
Information about current or potential team members' work may relate to:	• interests • lifestyle preferences • past jobs • technical strengths • work preferences • working styles
Different ways that different people may contribute may relate to individual strengths around:	• creating positive energy within the team • fundamental literacy strengths (e.g. particularly strong in visual literacy, written or spoken communication) • generating ideas • networks or spheres of influence • particular ways of thinking • powers of persuasion • problem-solving capacities • specific technical skills or knowledge
Ground rules may relate to:	• boundaries or lack of boundaries for team activities and ideas • confidentiality • copyright, moral rights or intellectual property • regularity of communication • key roles and responsibilities • time lines

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RANGE STATEMENT	
	• ways of communicating
Team-based innovation may be encouraged through:	• accessing training and learning opportunities • enough but not too much guidance and structure • equitable sharing of workload • follow-through with ideas • supportive communication
Behaviour that supports innovation may include being:	• collaborative • equitable • fair • fun • hardworking • reflective • responsible • sympathetic
External stimuli and ideas might be from:	• Australia or overseas • colleagues outside of the team • family and friends • internet • journals • networks or technical experts • other organisations
Challenges of being innovative may relate to:	• budgetary or other resource constraints • competing priorities • organisational culture • problems with breaking old patterns of behaviour or thinking • time pressures

Unit Sector(s)

Unit sector	

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Competency field

Competency field	Creativity and Innovation - Innovation

Co-requisite units

Co-requisite units		

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BSBINN502A Build and sustain an innovative work environment

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to create an environment that enables and supports the application of innovative practice. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit applies to individuals working in leadership or management roles in any industry or community context. The individual could be employed by the organisation, but may also be an external contractor, the leader of a cross organisation team or of a self formed team of individuals. The work group could be permanent or temporary in nature. The unit focuses on the skills and knowledge required to develop and implement a holistic approach to the integration of innovation across all areas of work practice. It also acknowledges the importance of wider contextual evaluation for potential innovations to ensure their value and benefit.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Lead innovation by example	1.1. Make innovation an integral part of ***leadership and management activities*** 1.2. Demonstrate positive reception of ideas from others and provide constructive advice 1.3. Establish and maintain relationships based on mutual respect and trust 1.4. Take considered ***risks*** to open up opportunities for innovation 1.5. Regularly evaluate own approaches for consistency with the wider organisational or project context
2. Establish work practices that support innovation	2.1. Consult on and establish ***working conditions*** that reflect and encourage innovative practice 2.2. Introduce and maintain ***workplace procedures*** that foster innovation and allow for rigorous ***evaluation of innovative ideas*** 2.3. Facilitate and participate in ***collaborative work arrangements*** to foster innovation 2.4. Build and lead teams to work in ***ways that maximise opportunities for innovation***
3. Promote innovation	3.1. Acknowledge suggestions, improvements and innovations from all colleagues 3.2. Find appropriate ***ways of celebrating and promoting innovation*** 3.3. Promote and reinforce the value of innovation according to the vision and objectives of the organisation or project 3.4. Promote and support the evaluation of innovative ideas within the wider organisational or project context
4. Create a physical environment which supports innovation	4.1. Evaluate the ***impact of the physical environment*** in relation to innovation 4.2. Collaborate with colleagues about ideas for enhancing the physical work environment before taking action 4.3. Consider potential for supporting innovation when selecting physical resources and equipment 4.4. Design, fit-out and decorate workspaces to encourage creative mindsets, collaborative working and the development of positive workplace relationships

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ELEMENT	PERFORMANCE CRITERIA
5. Provide learning opportunities	5.1. Pro-actively share relevant information, knowledge and skills with colleagues 5.2. Provide or encourage ***formal and informal learning opportunities*** to help develop the skills needed for innovation 5.3. Create opportunities in which individuals can learn from the experience of others

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication, consultation and negotiation skills to model and lead, open and collaborative relationships
- comprehension skills to interpret and develop information that may deal with complex ideas and relate to issues both within and outside a given workplace context
- planning and organisational skills to implement wide-ranging practical processes and procedures that support innovation
- problem-solving skills to assess and respond to challenges and risks around innovation at an operational management level
- self-management and learning skills to evaluate and enhance personal effectiveness, and to promote a culture of ongoing learning and development.

Required knowledge

- benefits of providing coaching and learning opportunities in relation to innovation
- concept of innovation, what it is and what it means for different people either working independently or within an organisation
- context for innovation in the relevant workplace context including core business values, overall objectives, broader environmental context and the need to ensure the value and benefit of innovative ideas and projects
- different ways of rewarding performance
- factors and tools that can motivate individuals to use creative thinking and apply innovative work practices
- legislative framework that impacts on operations in the relevant workplace context
- management principles and leadership styles, including the impact of different approaches on innovation
- typical challenges and barriers to innovation within teams and organisations, and ways of overcoming these
- ways in which workplace climate can affect individual attitudes and performance.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • establishment of procedures and practices (for a project or a workplace) which support and foster innovative work practice and include sound evaluation processes • modelling of behaviour that supports innovative work practice • knowledge and understanding of the role of leaders and managers in encouraging innovation, and the issues and challenges associated with building and sustaining an innovative work environment.
Context of and specific resources for assessment	Assessment must ensure: • involvement of a team for which the candidate provides leadership and guidance.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • evaluation of outcomes and processes from activities managed by the candidate, particularly in relation to how innovation and innovative practice was encouraged and supported • oral or written questioning to assess knowledge of ways that innovation can be fostered and the typical challenges and barriers to innovation.
Guidance information for assessment	Innovation does not occur in isolation. Holistic assessment with other units relevant to the industry sector, workplace and job role is highly recommended.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Leadership and management activities may include:	• people management practices • planning processes • regular management meetings • review processes
Risks may include:	• budgetary issues • challenging changes in relationships, work practices and general workplace climate • unforseen impacts of innovative ideas
Working conditions may include:	• family-friendly leave entitlements • flexible working hours • social leave • study leave • time provided for coming up with ideas
Workplace procedures may relate to:	• briefing processes • client relations • performance management • project management • staff meetings • training
Evaluation of innovative ideas may relate to:	• analysing consistency with overall goals, values or vision • assessing resource requirements and practicalities • assessing the potential to find 'champions' or supporters • evaluating the external factors that may impact on the idea • exploring the implications of ideas that may stretch or change existing ways of doing things
Collaborative work arrangements might be:	• cross section • vertical teams • within a section • working with supplier organisations or partner

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RANGE STATEMENT	
	organisations
Ways that maximise opportunities for innovation may relate to:	• collaborating • collecting data • creative thinking • future scanning • getting feedback • making suggestions • networking
Ways of celebrating and promoting innovation may include:	• congratulating the project team • ensuring management acknowledgment • providing a newsletter story about the idea • using the idea to help foster other ideas • well-planned group incentive schemes
Impact of the physical environment may relate to:	• eating areas • extent to which design or style links with declared philosophies or objectives • external areas • general ambience of the work environment • location of different people • presence and ambience of relaxation areas • style of dÃ©cor • use of creative messages or images in the workplace • workspace design and dÃ©cor • workstation arrangements and opportunities for interaction
Formal and informal learning opportunities may include:	• coaching • conferences • formal training courses/programs • information seminars • job rotation • mentoring • online learning

Unit Sector(s)

Unit sector	

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Competency field

Competency field	Creativity and Innovation - Innovation

Co-requisite units

Co-requisite units		

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BSBLED401A Develop teams and individuals

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to determine individual and team development needs and to facilitate the development of the workgroup. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit applies to individuals with a broad knowledge of learning and development who apply their skills in addressing development needs to meet team objectives. They may have responsibility to provide guidance or to delegate aspects of tasks to others.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Determine development needs	1.1. Systematically identify and implement ***learning and development needs*** in line with ***organisational requirements*** 1.2. Ensure that a learning plan to meet individual and group training and development needs is collaboratively developed, agreed to and implemented 1.3. Encourage individuals to self-evaluate performance and identify areas for improvement 1.4. Collect ***feedback on performance*** of team members from relevant sources and compare with established team learning needs
2. Develop individuals and teams	2.1. Identify learning and development program goals and objectives, ensuring a match to the specific knowledge and skill requirements of competency standards relevant to the industry 2.2. Ensure that ***learning delivery methods*** are appropriate to the learning goals, the learning style of participants, and availability of ***equipment and resources*** 2.3. Provide workplace learning opportunities, and ***coaching and mentoring assistance*** to facilitate individual and team achievement of competencies 2.4. Create development opportunities that incorporates a range of activities and support materials appropriate to the achievement of identified competencies 2.5. Identify and approve resources and time lines required for learning activities in accordance with organisational requirements
3. Monitor and evaluate workplace learning	3.1. Use feedback from individuals or teams to identify and implement improvements in future learning arrangements 3.2. Assess and record outcomes and performance of individuals/teams to determine the effectiveness of development programs and the extent of additional development support 3.3. Negotiate modifications to learning plans to improve the efficiency and effectiveness of learning 3.4. Document and maintain records and reports of competency according to organisational requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to receive and report on feedback, to maintain effective relationships and to manage conflict
- culturally appropriate communication skills to relate to people from diverse backgrounds and people with diverse abilities
- leadership skills to gain trust and confidence of clients and colleagues
- literacy skills to read, write and understand a variety of texts; and to edit and proofread documents to ensure clarity of meaning, accuracy and consistency of information
- negotiation skills to achieve mutually acceptable outcomes
- technology skills to support effective communication and presentation.

Required knowledge

- key provisions of relevant legislation from all levels of government that may affect aspects of business operations, such as:
  - anti-discrimination legislation
  - ethical principles
  - codes of practice
  - privacy laws
  - occupational health and safety (OHS)
- facilitation techniques to encourage team development and improvement
- organisational policies, plans and procedures
- career paths and competency standards relevant to the industry.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • identifying and implementing learning opportunities for others • giving and receiving feedback from team members to encourage participation in and effectiveness of team • creating learning plans to match skill needs • knowledge of relevant legislation.
Context of and specific resources for assessment	Assessment must ensure: • access to an actual workplace or simulated environment • access to office equipment and resources • examples of learning and development plans, policies and procedures • examples of documents relating to diversity policies and procedures.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • analysis of responses to case studies and scenarios • oral or written questioning to assess knowledge of career paths and competency standards relevant to the industry • review of records and reports of competency.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • management units • other learning and development units.

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Range Statement

RANGE STATEMENT	
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Learning and development needs may include:	• career planning/development • coaching, mentoring and/or supervision • formal/informal learning programs • internal/external training provision • performance appraisals • personal study • recognition of current competence/skills recognition • work experience/exchange/opportunities • workplace skills assessment
Organisational requirements may include:	• access and equity principles and practices • anti-discrimination and related policy • business and performance plans • confidentiality and security requirements • defined resource parameters • ethical standards • goals, objectives, plans, systems and processes • legal and organisational policies, guidelines and requirements • OHS policies, procedures and programs • quality and continuous improvement processes and standards • quality assurance and/or procedures manuals
Feedback on performance may include:	• formal/informal performance appraisals • obtaining feedback from clients • obtaining feedback from supervisors and colleagues • personal, reflective behaviour strategies • routine organisational methods for monitoring service delivery
Learning delivery methods may include:	• conference and seminar attendance • formal course participation • induction

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RANGE STATEMENT	
	• involvement in professional networks • on-the-job coaching or mentoring • presentations/demonstrations • problem-solving • work experience
Equipment and resources may include:	• facilities • funding • guest speakers • technological tools and equipment • time • training equipment such as whiteboards and audio-visual equipment
Coaching and mentoring assistance may include:	• fair and ethical practice • non-discriminatory processes and activities • presenting and promoting a positive image of the collective group • problem-solving • providing encouragement • providing feedback to another team member • respecting the contribution of all participants and giving credit for achievements

Unit Sector(s)

Unit sector	

Competency field

Competency field	Workforce Development - Learning and Development

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Co-requisite units

Co-requisite units		

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BSBMGT402A Implement operational plan

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to implement the operational plan by monitoring and adjusting operational performance, producing short term plans for the department/section, planning and acquiring resources and providing reports on performance as required. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	Frontline managers are actively engaged in planning activities to achieve the measurable, stated objectives of the team and the organisation. This key role is carried out to provide safe, efficient and effective products and services to customer satisfaction within the organisation's productivity and profitability plans. At this level, work will normally be carried out within routine and non routine methods and procedures, which require planning, evaluation, leadership and guidance of others.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Implement operational plan	1.1. Collate, analyse and organise details of ***resource requirements*** in consultation with ***relevant personnel***, ***colleagues and specialist resource managers*** 1.2. Implement ***operational plans*** to contribute to the achievement of organisation's performance/business plan 1.3. Identify and use ***key performance indicators*** (KPIs) to monitor operational performance 1.4. Undertake ***contingency planning*** and ***consultation processes*** 1.5. Provide assistance in the development and presentation of proposals for resource requirements in line with operational planning processes
2. Implement resource acquisition	2.1. Recruit and induct employees within ***organisation's policies***, ***practices and procedures*** 2.2. Implement plans for acquisition of physical resources and services within organisation's policies, practices and procedures and in consultation with relevant personnel
3. Monitor operational performance	3.1. Monitor ***performance systems and processes*** to assess progress in achieving profit/productivity plans and targets 3.2. Analyse and use budget and actual financial information to monitor profit/productivity performance 3.3. Identify unsatisfactory performance and take prompt action to rectify the situation according to organisational policies 3.4. Provide mentoring, coaching and supervision to support individuals and teams to use resources effectively, economically and safely 3.5. Present recommendations for variation to operational plans to the ***designated persons***/***groups*** and gain approval 3.6. Implement ***systems***, ***procedures and records*** associated with performance in accordance with organisation's requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- coaching and mentoring skills to provide support to colleagues
- literacy skills to access and use workplace information, and to prepare reports
- planning and organising skills to monitor performance and to sequence work of self and others to achieve planned outcomes.

Required knowledge

- principles and techniques associated with:
  - contingency planning
  - methods for monitoring and reporting on performance
  - monitoring and implementing operations and procedures
  - problem identification and methods of resolution
  - relevant budgeting and financial analysis, interpretation and reporting requirements
  - resource management systems at the tactical implementation level
  - resource planning and acquisition
  - tactical risk analysis including identification and reporting requirements.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • ability to monitor and adjust operational performance, produce short-term plans for the department or section, plan and acquire resources, and provide reports on performance as required • knowledge of principles and techniques associated with monitoring and implementing operations and procedures.
Context of and specific resources for assessment	Assessment must ensure: • access to appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • review of documentation outlining contingency planning and consultation processes undertaken • demonstration of techniques in managing performance • evaluation of mentoring, coaching and supervision provided to support individuals and teams to use resources effectively, economically and safely.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other units from the Certificate IV in Frontline Management.

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Range Statement

RANGE STATEMENT	
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Resource requirements may refer to:	• goods and services to be purchased and ordered • human, physical and financial resources - both current and projected • stock requirements and requisitions
Relevant personnel, ***colleagues and specialist resource managers*** may include:	• colleagues and specialist resource managers • managers • occupational health and safety committees and other people with specialist responsibilities • other employees • people from a wide range of social, cultural and ethnic backgrounds, and people with a range of physical and mental abilities • supervisors
Operational plans may refer to:	• organisational plans • tactical plans developed by the department or section to detail product and service performance
Key performance indicators may refer to:	• measures for monitoring or evaluating the efficiency or effectiveness of a system, and which may be used to demonstrate accountability and to identify areas for improvements
Contingency planning may refer to:	• contracting out or outsourcing human resources and other functions or tasks • diversification of outcomes • finding cheaper or lower quality raw materials and consumables • increasing sales or production • recycling and re-use • rental, hire purchase or alternative means of procurement of required materials, equipment and stock • restructuring of organisation to reduce labour

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RANGE STATEMENT	
	costs • risk identification, assessment and management processes • seeking further funding • strategies for reducing costs, wastage, stock or consumables • succession planning
Consultation processes may refer to:	• mechanisms used to provide feedback to the work team in relation to outcomes of consultation • meetings, interviews, brainstorming sessions, email/intranet communications, newsletters or other processes and devices which ensure that all employees have the opportunity to contribute to team and individual operational plans
Organisation's policies, ***practices and procedures*** may include:	• organisational culture • Standard Operating Procedures • organisational guidelines which govern and prescribe operational functions, such as the acquisition and management of human and physical resources • undocumented practices in line with organisational operations

Performance systems and processes may refer to:	• informal systems used by frontline managers for the work team in the place of existing organisation-wide systems
	• formal processes within the organisation to measure performance, such as:
	  • feedback arrangements
	  • individual and teamwork plans
	  • KPIs
	  • specified work outcomes

Designated persons/***groups*** may include:	• other affected work groups or teams and groups designated in workplace policies and procedures • those who have the authority to make decisions and/or recommendations about operations such as workplace supervisors, other managers
Systems, ***procedures and records***	• databases and other recording mechanisms for ensuring records are kept in accordance with

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RANGE STATEMENT	
may include:	organisational requirements • individual and team performance plans • organisational policies and procedures relative to performance

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Management

Co-requisite units

Co-requisite units		

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BSBMGT403A Implement continuous improvement

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to implement the organisation's continuous improvement systems and processes. Particular emphasis is on using systems and strategies to actively encourage the team to participate in the process, monitoring and reviewing performance, and identifying opportunities for further improvements. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	Frontline managers have an active role in implementing the continuous improvement process to achieve the organisation's objectives. Their position, closely associated with the creation and delivery of products and services, means that they have an important role in influencing the ongoing development of the organisation. At this level, work will normally be carried out within routine and non routine methods and procedures, which require planning and evaluation, and leadership and guidance of others.

Licensing/Regulatory Information

Not applicable.

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Implement continuous improvement systems and processes	1.1. Implement ***systems*** to ensure that individuals and teams are actively encouraged and supported to ***participate in decision making processes***, assume responsibility and exercise initiative 1.2. Communicate the organisation's ***continuous improvement processes*** to individuals and teams, and obtain feedback 1.3. Ensure effective ***mentoring and coaching*** allows individuals and teams to implement the organisation's continuous improvement processes
2. Monitor and review performance	2.1. Use the organisation's systems and ***technology*** to monitor and review progress and to identify ways in which planning and operations could be improved 2.2. Improve ***customer service*** through continuous improvement techniques and processes 2.3. Formulate and communicate recommendations for adjustments to those who have a role in their development and implementation
3. Provide opportunities for further improvement	3.1. Implement ***processes to ensure that team members are informed of savings and productivity/service improvements*** in achieving the business plan 3.2. Document work performance to aid the identification of further opportunities for improvement 3.3. Manage records, reports and recommendations for improvement within the organisation's systems and processes

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE This section describes the skills and knowledge required for this unit.
Required skills

• communication skills to:
  • coach and mentor team members
  • gain the commitment of individuals and teams to continuously improve
• innovation skills to design better ways of performing work.

Required knowledge

• principles and techniques associated with:
  • benchmarking
  • best practice
  • change management
  • continuous improvement systems and processes
  • quality systems.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • taking active steps to implement, monitor and adjust plans, processes and procedures to improve performance • supporting others to implement the continuous improvement system/processes, and to identify and report opportunities for further improvement • knowledge of principles and techniques associated with continuous improvement systems and processes.
Context of and specific resources for assessment	Assessment must ensure: • access to appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • assessment of written reports • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • observation of presentations • oral or written questioning to assess knowledge of principles and techniques associated with change management • review of how the organisation's continuous improvement processeswascommunicated to individuals and teams • review of documentation of work performance.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other units from the Certificate IV in Frontline Management.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Systems may refer to:	• forums, meetings • newsletters and reports • organisational policies and procedures • web-based communication devices
Participation in decision making processes may include:	• feedback in relation to outcomes of the consultative process • processes which ensures all employees have the opportunity to contribute to organisational issues
Continuous improvement processes may include:	• cyclical audits and reviews of workplace, team and individual performance • evaluations and monitoring of effectiveness • implementation of quality systems, such as International Standardization for Organization (ISO) • modifications and improvements to systems, processes, services and products • policies and procedures which allow the organisation to systematically review and improve the quality of its products, services and procedures • seeking and considering feedback from a range of stakeholders
Mentoring and coaching may refer to:	• providing assistance with problem-solving • providing feedback, support and encouragement • teaching another member of the team, usually focusing on a specific work task or skill
Technology may include:	• computerised systems and software such as databases, project management and word processing • telecommunications devices • any other technology used to carry out work roles and responsibilities

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RANGE STATEMENT	
Customer service may be:	• internal or external • to existing, new or potential clients
Processes to ensure that team members are informed of savings and productivity/service improvements may refer to:	• email/intranet, newsletters or other communication devices • newsletters and bulletins • staff reward mechanisms • team meetings

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Management

Co-requisite units

Co-requisite units		

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BSBMGT502B Manage people performance

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to manage the performance of staff who report to them directly. Development of key result areas and key performance indicators and standards, coupled with regular and timely coaching and feedback, provide the basis for performance management. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit applies to all managers and team leaders who manage people. It covers work allocation and the methods to review performance, reward excellence and provide feedback where there is a need for improvement. The unit makes the link between performance management and performance development, and reinforces both functions as a key requirement for effective managers. This is a unit that all managers/prospective managers who have responsibility for other employees should strongly consider undertaking.

Licensing/Regulatory Information

Not applicable.

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Allocate work	1.1. Consult relevant groups and individuals on work to be allocated and resources available 1.2. Develop work plans in accordance with operational plans 1.3. Allocate work in a way that is efficient, cost effective and outcome focussed 1.4. Confirm ***performance standards***, ***Code of Conduct*** and work outputs with relevant teams and individuals 1.5. Develop and agree ***performance indicators*** with relevant staff prior to commencement of work 1.6. Conduct ***risk analysis*** in accordance with the organisational risk management plan and legal requirements
2. Assess performance	2.1. Design ***performance management*** and review processes to ensure consistency with organisational objectives and policies 2.2. Train participants in the performance management and review process 2.3. Conduct performance management in accordance with organisational protocols and time lines 2.4. Monitor and evaluate performance on a continuous basis
3. Provide feedback	3.1. Provide informal feedback to staff on a regular basis 3.2. Advise relevant people where there is poor performance and take necessary actions 3.3. Provide on-the-job coaching when necessary to improve performance and to confirm ***excellence in performance*** 3.4. Document performance in accordance with the organisational performance management system 3.5. Conduct formal structured feedback sessions as necessary and in accordance with organisational policy
4. Manage follow up	4.1. Write and agree performance improvement and development plans in accordance with organisational policies 4.2. Seek assistance from human resources specialists where appropriate 4.3. Reinforce excellence in performance through recognition and continuous feedback

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ELEMENT	PERFORMANCE CRITERIA
	4.4. Monitor and coach individuals with poor performance 4.5. Provide support services where necessary 4.6. Counsel individuals who continue to perform below expectations and implement the disciplinary process if necessary 4.7. ***Terminate*** staff in accordance with legal and organisational requirements where serious misconduct occurs or ongoing poor-performance continues

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to articulate expected standards of performance, to provide effective feedback and to coach staff who need development • risk management skills to analyse, identify and develop mitigation strategies for identified risks • planning and organisation skills to ensure a planned and objective approach to the performance management system.
Required knowledge
• relevant legislation from all levels of government that affects business operation, especially in regard to occupational health and safety and environmental issues, equal opportunity, industrial relations and anti-discrimination • relevant awards and certified agreements • performance measurement systems utilised within the organisation • unlawful dismissal rules and due process • staff development options and information.

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Evidence Guide

EVIDENCE GUIDE	
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Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • documented performance indicators and a critical description and analysis of performance management system from the workplace • techniques in providing feedback and coaching for improvement in performance • knowledge of relevant awards and certified agreements.
Context of and specific resources for assessment	Assessment must ensure: • access to appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • analysis of responses to case studies and scenarios • assessment of written reports • demonstration of techniques in providing feedback and coaching • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • review of work plans, performance indicators, risk analysis,performance management and review processes, performance improvement and development plans.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other management units.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Performance standards mean:	• level of performance sought from an individual or group which may be expressed either quantitatively or qualitatively
Code of Conduct means:	• agreed (or decreed) set of rules relating to employee behaviour/conduct with other employees or an agreed (or decreed) set of rules relating to employee behaviour/conduct with other employees or customers
Performance indicators mean:	• measures against which performance outcomes are gauged
Risk analysis means:	• determination of the likelihood of a negative event preventing the organisation meeting its objectives and the likely consequences of such an event on organisational performance
Performance management means:	• in accordance with relevant industrial agreements • process or set of processes for establishing a shared understanding of what an individual or group is to achieve, and managing and developing individuals in a way which increases the probability it will be achieved in both the short- and long-term
Excellence in performance means:	• regularly and consistently exceeding the performance targets established while meeting the organisation's performance standards
Termination means:	• cessation of the contract of employment between an employer and an employee, at the initiative of the employer within relevant industrial agreements

Unit Sector(s)

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Unit sector	

Competency field

Competency field	Management and Leadership - Management

Co-requisite units

Co-requisite units		

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BSBMGT516C Facilitate continuous improvement

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to lead and manage continuous improvement systems and processes. Particular emphasis is on the development of systems and the analysis of information to monitor and adjust performance strategies, and to manage opportunities for further improvements. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit applies to managers who take an active role in managing a continuous improvement process in order to achieve an organisation's objectives. Where managers are closely associated with the creation and delivery of products and services, they play an important part in influencing the ongoing development of the organisation. At this level, work will normally be carried out using complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem-solving and decision-making strategies.

Licensing/Regulatory Information

Not applicable.

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Lead continuous improvement systems and processes	1.1. Develop ***strategies*** to ensure that team members are actively encouraged and supported to participate in decision-making processes, assume responsibility and exercise initiative as appropriate 1.2. Establish ***systems*** to ensure that the organisation's ***continuous improvement processes*** are communicated to ***stakeholders*** 1.3. Ensure that change and improvement processes meet ***sustainability requirements*** 1.4. Develop effective mentoring and coaching processes to ensure that individuals and teams are able to implement and support the organisation's continuous improvement processes 1.5. Ensure that insights and experiences from business activities are captured and accessible through ***knowledge management systems***
2. Monitor and adjust performance strategies	2.1. Develop strategies to ensure that systems and processes are used to monitor ***operational progress*** and to identify ways in which planning and operations could be improved 2.2. Adjust and communicate strategies to stakeholders according to organisational procedures
3. Manage opportunities for further improvement	3.1. Establish processes to ensure that team members are informed of outcomes of continuous improvement efforts 3.2. Ensure processes include ***recording of work team performance*** to assist in identifying further opportunities for improvement 3.3. Consider areas identified for further improvement when undertaking future planning

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills tocommunicate opportunities for improvement • learning skills to coach and mentor staff, using a range of methods to cater for different learning styles • innovation and lateral thinking skills to design better ways for achieving work outcomes • planning skills to establish and monitor systems and process for continuous improvement • teamwork and leadership skills to gain the confidence and trust of others
Required knowledge
• continuous improvement models • knowledge management systems • quality systems • sustainability principles

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • development and use of a range of strategies and approaches that improve work outcomes or organisational functioning, using continuous improvement models • monitoring performance and customer service.
Context of and specific resources for assessment	Assessment must ensure access to appropriate documentation and resources normally used in the workplace.
Method of assessment	The following assessment methods are appropriate for this unit: • analysis of responses to case studies and scenarios • assessment of reports • direct questioning combined with review of portfolios of evidence and third-party workplace reports of on-the-job performance by the candidate • observationof presentations • oral or written questioning to assess knowledge of quality systems • review of strategies developed to ensure that team members are actively encouraged and supported to participate in decision-making processes, assume responsibility and exercise initiative • evaluation of how customer-service strategies were communicated to stakeholders • review of documentation outlining work team performance.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Strategies may refer to:	• clarification of roles and expectations • communication devices and processes, such as intranet and email communication systems, to facilitate input into workplace decisions • long-term or short-term plans that factor in opportunities for team input • mentoring and 'buddy' systems to support team members to participate in decision making • performance plans • reward and recognition programs for high performing staff • training and development activities.
Systems may refer to:	• forums and meetings • newsletters and reports • policies and procedures • electronic communication devices.
Continuous improvement processes may include:	• cyclical audits and reviews of workplace, team and individual performance • evaluations and monitoring of effectiveness • modifications and improvements to systems, processes, services and products • policies and procedures that allow an organisation to systematically review and improve the quality of its products, services and procedures • seeking and considering feedback from a range of stakeholders.
Stakeholders may include:	• business or government contacts • funding bodies • individuals within the work team • internal and external contacts • organisation's clients and customers • professional associations • senior management and board members

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RANGE STATEMENT	
	• unions and employee groups.
Sustainability requirements may include:	• addressing environmental and resource sustainability initiatives, such as environmental management systems, action plans, green office programs, surveys and audits • applying the waste management hierarchy in the workplace • complying with regulations and corporate social responsibility considerations for sustainability to enhance the organisation's standing in business and community environments • determining organisation's most appropriate waste treatment, including waste to landfill, recycling, re-use, recoverable resources and wastewater treatment • implementing ecological footprinting • implementing environmental management systems, e.g. ISO 14001:1996 Environmental management systems life cycle analyses • implementing government initiatives, e.g. Australian government's Greenhouse Challenge Plus • improving resource and energy efficiency • initiating and maintaining appropriate organisational procedures for operational energy consumption • introducing a green office program (a cultural change program) • introducing green purchasing • introducing national and international reporting initiatives, e.g. Global Reporting Initiative • introducing product stewardship • reducing emissions of greenhouse gases • reducing use of non-renewable resources • referencing standards, guidelines and approaches, such as sustainability covenants and compacts or triple bottom line reporting • supporting sustainable supply chain.
Knowledge management systems may include:	• best practice transfer • communities of practice • cross-project learning • expert directories • knowledge brokers' knowledge mapping • knowledge repositories • measuring and reporting intellectual capital • mentoring

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RANGE STATEMENT	
	• performance management • post-project reviews • proximity and architecture • social software • storytelling.
Operational progress may refer to:	• customer service indicators • OHS indicators • productivity gains • success in meeting agreed goals and performance indicators.
Recording of work team performance may include:	• annotated performance plans • quantitative data, such as production figures • recommendations for improvement • records and reports.

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and leadership - management

Co-requisite units

Co-requisite units		

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BSBWOR401A Establish effective workplace relationships

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to collect, analyse and communicate information and to use that information to develop and maintain effective working relationships and networks, with particular regard to communication and representation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	Frontline managers play an important role in developing and maintaining positive relationships in internal and external environments so that customers, suppliers and the organisation achieve planned outputs and outcomes. They play a prominent part in motivating, mentoring, coaching and developing team cohesion through providing leadership for the team and forming the bridge between the management of the organisation and team members. At this level, work will normally be carried out within routine and non routine methods and procedures, which require planning and evaluation, and leadership and guidance of others.

Licensing/Regulatory Information

Not applicable.

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Collect, analyse and communicate information and ideas	1.1. Collect relevant ***information*** from appropriate sources and analyse and share with the work team to improve work performance 1.2. Communicate ideas and information in a manner which is appropriate and sensitive to the cultural and social diversity of the audience and any specific needs 1.3. Implement ***consultation processes*** to encourage employees to contribute to issues related to their work, and promptly relay feedback to the work team in regard to outcomes 1.4. Seek and value contributions from internal and external sources in developing and refining new ideas and approaches 1.5. Implement ***processes*** to ensure that issues raised are resolved promptly or referred to ***relevant personnel*** as required
2. Develop trust and confidence	2.1. Treat all internal and external contacts with integrity, respect and empathy 2.2. Use the ***organisation's social***, ***ethical and business standards*** to develop and maintain effective relationships 2.3. Gain and maintain the trust and confidence of ***colleagues***, ***customers and suppliers*** through competent performance 2.4. Adjust interpersonal styles and methods to meet organisation's social and cultural environment 2.5. Encourage other members of the work team to follow examples set, according to ***organisation's policies and procedures***
3. Develop and maintain networks and relationships	3.1. Use ***networks*** to identify and build relationships 3.2. Use networks and other work relationships to provide identifiable benefits for the team and organisation
4. Manage difficulties into positive outcomes	4.1. Identify and analyse difficulties, and take action to rectify the situation within the requirements of the organisation and relevant legislation 4.2. Guide and support colleagues to resolve work difficulties 4.3. Regularly review and improve ***workplace outcomes***

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ELEMENT	PERFORMANCE CRITERIA
	in consultation with relevant personnel 4.4. Manage ***poor work performance*** within the organisation's processes 4.5. Manage conflict constructively within the organisation's processes

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- coaching and mentoring skills to provide support to colleagues
- literacy skills to research, analyse, interpret and report information
- relationship management and communication skills to:
  - deal with people openly and fairly
  - forge effective relationships with internal and/or external people, and to develop and maintain these networks
  - gain the trust and confidence of colleagues
  - respond to unexpected demands from a range of people
  - use supportive and consultative processes effectively.

Required knowledge

- relevant legislation from all levels of government that affects business operation, especially in regard to occupational health and safety (OHS), and environmental issues, equal opportunity, industrial relations and anti-discrimination
- theory associated with managing work relationships to achieve planned outcomes:
  - developing trust and confidence
  - maintaining consistent behaviour in work relationships
  - understanding the cultural and social environment
  - identifying and assessing interpersonal styles
  - establishing, building and maintaining networks
  - identifying and resolving problems
  - resolving conflict
  - managing poor work performance
  - monitoring, analysing and introducing ways to improve work relationships.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • range of methods and techniques for communicating information and ideas to a range of stakeholders • range of methods and techniques for developing positive work relationships that build trust and confidence in the team • accessing and analysing information to achieve planned outcomes • techniques for resolving problems and conflicts and dealing with poor performance • knowledge of the theory associated with managing work relationships to achieve planned outcomes.
Context of and specific resources for assessment	Assessment must ensure: • access to appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • demonstration of techniques in managing poor performance and communicating effectively • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • observation of performance in role plays • observation of presentations • oral or written questioning to assess knowledge of relevant legislation • review of consultation processesimplemented to encourage employees to contribute to issues related to their work • review of documentation outlining reviewing ofworkplace outcomes.
Guidance information for	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended,

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EVIDENCE GUIDE	
assessment	for example: • other units from the Certificate IV in Frontline Management.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	

Information may include:	• data appropriate to work roles and organisational policies that is shared and retrieved in writing or verbally, electronically or manually such as:
	  • archived, filed and historical background data
	  • individual and team performance data
	  • marketing and customer related data
	  • planning and organisational documents including the outcomes of continuous improvement and quality assurance
	  • policies and procedures

Consultation processes may include:	• feedback to the work team and relevant personnel in relation to outcomes of the consultation process • opportunities for all employees to contribute to ideas and information about organisational issues
Processes to ensure that issues raised are resolved promptly or referred may include:	• conducting informal meetings • coordinating surveys or questionnaires • distributing newsletters or reports • exchanging informal dialogue with relevant personnel • participating in planned organisational activities
Relevant personnel may include:	• managers • OHS committee and other people with specialist responsibilities • other employees • supervisors • union representatives/groups
Organisation's social, ***ethical and business standards*** may refer to:	• implied standards such as honesty and respect relative to the organisational culture and generally accepted within the wider

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RANGE STATEMENT	

	community
	• rewards and recognition for high performing staff
	• standards expressed in legislation and regulations such as anti-discrimination legislation
	• written standards such as those expressed in:
	  • code of workplace conduct/behaviour
	  • dress code
	  • policies
	  • statement of workplace values
	  • vision and mission statements

Colleagues, ***customers and suppliers*** may include:	• both internal and external contacts • employees at the same level and more senior managers • people from a wide variety of social, cultural and ethnic backgrounds • team members
Organisation's policies and procedures may refer to:	• Materials Safety Data Sheets • organisational tasks and activities undertaken to meet performance outcomes • sets of accepted actions approved by the organisation • Standard Operating Procedures
Networks may be:	• established structures or unstructured arrangements and may include business or professional associations • informal or formal and with individuals or groups • internal and/or external
Workplace outcomes may include:	• OHS processes and procedures • performance of the work team
Poor work performance may refer to:	• individual team members • organisation as a whole • self • whole work team

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Unit Sector(s)

Unit sector	

Competency field

Competency field	Industry Capability - Workplace Effectiveness

Co-requisite units

Co-requisite units		

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BSBWOR402A Promote team effectiveness

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to promote teamwork. It involves developing team plans to meet expected outcomes, leading the work team, and proactively working with the management of the organisation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	Frontline managers have an important leadership role in the development of efficient and effective work teams. They play a prominent part in team planning, supervising the performance of the team and developing team cohesion. They provide leadership for the team and bridge the gap between the management of the organisation and the team members. As such they must 'manage up' as well as manage their team/s.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan to achieve team outcomes	1.1. Identify, establish and document ***team purpose***, ***roles***, ***responsibilities***, ***goals***, ***plans and objectives*** in ***consultation*** with team members 1.2. Support team members in meeting expected outcomes
2. Develop team cohesion	2.1. Provide opportunities for input of team members into planning, decision making and operational aspects of work team 2.2. Encourage and support team members to take ***responsibility for own work*** and to assist each other in undertaking required roles and responsibilities 2.3. Provide ***feedback*** to team members to encourage, value and reward individual and team efforts and contributions 2.4. Recognise and address issues, concerns and problems identified by team members or refer to ***relevant persons*** as required
3. Participate in and facilitate work team	3.1. Actively encourage team members to participate in and take responsibility for team activities and communication processes 3.2. Give the team support to identify and resolve problems which impede its performance 3.3. Ensure own contribution to work team serves as a role model for others and enhances the organisation's image within the work team, the organisation and with clients/customers
4. Liaise with management	4.1. Maintain open ***communication*** with ***line manager***/***management*** at all times 4.2. Communicate information from line manager/management to the team 4.3. Communicate unresolved issues, concerns and problems raised by the team/team members to line manager/management and ensure follow-up action is taken 4.4. Communicate unresolved issues, concerns and problems related to the team/team members raised by line managers/management to the team and ensure follow-up to action is taken

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - boost team morale
  - deal with team conflict
  - deliver messages from management
  - facilitate discussion
  - mentor and coach
- leadership skills
- planning and organising skills.

Required knowledge

- organisational goals, objectives and plans
- organisational policy and procedures framework
- organisational structure, including organisational chart
- principles and techniques associated with:
  - delegation and work allocation
  - goal setting
  - group dynamics and processes
  - individual behaviour and difference
  - leadership
  - motivation
  - negotiation
  - planning.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • teamwork plan with details of how it was generated and how it will be monitored so that team goals can be met • techniques in communicating information, dealing with team conflict and resolving issues • knowledge of organisational goals, objectives and plans.
Context of and specific resources for assessment	Assessment must ensure: • access to appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • analysis of responses to case studies and scenarios • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • observation of demonstrated techniques in working with team dynamics • observation of performance in role plays • oral or written questioning to assess knowledge of principles and techniques associated with group dynamics and processes • evaluation of opportunities provided for input of team members into planning, decision making and operational aspects of work team • review of feedback provided to team members • review of teamwork plan.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other units from the Certificate IV in Frontline

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EVIDENCE GUIDE	
	Management.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Team purpose, ***roles***, ***responsibilities***, ***goals***, ***plans and objectives*** may include:	• action plans, business plans and operational plans linked to strategic plans • expected outcomes and outputs • goals for individuals and the work team • individual and team performance plans and key performance indicators • occupational health and safety (OHS) responsibilities
Consultation may include:	• attending meetings, interviews, brainstorming sessions • using email/intranet communications, newsletters or other processes and devices which ensure that all employees have the opportunity to contribute to team and individual effectiveness • using mechanisms to provide feedback to the work team in relation to consultation outcomes
Responsibility for own work may involve:	• individual and joint actions • individuals and teams
Feedback may refer to:	• formal/informal gatherings between team members where there is communication on work related matters • informal communication of ideas and thoughts on specific tasks, outcomes, decisions, issues or behaviours
Relevant persons may include:	• colleagues • direct superior or other management representatives • OHS committees and other people with specialist responsibilities
Communication may include:	• face-to-face • formal/informal interaction

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	• verbal, written or electronic communication
Line manager*/*management may refer to:	• direct superior or other management representatives

Unit Sector(s)

Unit sector	

Competency field

Competency field	Management and Leadership - Management

Co-requisite units

Co-requisite units		

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BSBWOR404B Develop work priorities

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to plan one's own work schedules, to monitor and to obtain feedback on work performance and development. It also addresses the requirement to take responsibility for one's own career planning and professional development. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit applies to individuals who are required to design their own work schedules and work plans, and to establish priorities for their work. They will typically hold some responsibilities for the work of others and have some autonomy in relation to their own role.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan and complete own work schedule	1.1. Prepare ***Workgroup*** plans which reflect consideration of resources, client needs and workgroup targets 1.2. Analyse and incorporate ***Work objectives*** and priorities into personal schedules and responsibilities 1.3. Identify ***Factors affecting the achievement of work objectives*** and establish contingencies and incorporate them into work plans 1.4. Efficiently and effectively use ***Business technology*** to manage and monitor planning completion and scheduling of tasks
2. Monitor own work performance	2.1. Identify and analysed personal performance through self-assessment and feedback from others on the achievement of work objectives 2.2. Seek and evaluate ***Feedback on performance*** from colleagues and clients in the context of individual and group requirements 2.3. Routinely identify and report on variations in the quality of service and performance in accordance with organisational requirements
3. Coordinate professional development	3.1. Assess personal knowledge and skills against organisational benchmarks to determine development needs and priorities 3.2. Research and identify sources and plan for opportunities for improvement in consultation with colleagues 3.3. Use ***Feedback*** to identify and develop ways to improve competence within available opportunities 3.4. Identify, access and complete ***professional development activities*** to assist career development 3.5. Store and maintain records and documents relating to achievements and assessments in accordance with organisational requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- learning skills to recognise and develop new and necessary skills and knowledge
- literacy skills to understand the organisation's policies, procedures and communications, to write personal work plans and professional development plans, and to request and receive feedback about performance
- organising skills to prioritise, manage time and meet deadlines
- problem solving skills to develop contingency plans

Required knowledge

- knowledge of relevant business technology applications to schedule tasks and plan work
- knowledge of techniques to prepare personal plans and establish priorities
- methods to identify and prioritise personal learning needs
- understanding of a range of professional development options
- understanding of methods to elicit, analyse and interpret feedback
- understanding of methods to evaluate own performance

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • preparing and communicating own work plan • scheduling work objectives and tasks to support the achievement of goals • seeking and acting on feedback from clients and colleagues • reviewing own work performance against achievements through self-assessment • accessing learning opportunities to extend own personal work competencies • using business technology to monitor self development.
Context of and specific resources for assessment	Assessment must ensure: • the learner and trainer should have access to appropriate documentation and resources normally used in the workplace
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • observation of performance in role plays • observation of presentations • review of work and professional development plans.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • Other units from the Certificate IV in Frontline Management.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Workgroup plans may include:	• budgetary plans • production plans • reporting plans • sales plans • team and individual learning goals • team participation • work schedules
Work objectives may include:	• budgetary targets • production targets • reporting deadlines • sales targets • team and individual learning goals • team participation
Factors affecting the achievement of work objectives may include:	• budget constraints • competing work demands • environmental factors such as time, weather, etc • personnel • resource and materials availability • technology/equipment breakdowns • unforeseen incidents
Business technology may include:	• computer applications • computers • email and internet/intranet/extranet • facsimile machines • modems • personal schedules • photocopiers • printers • scanners
Feedback on performance may include:	• formal/informal performance appraisals • obtaining comments from clients • obtaining comments from supervisors and

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	colleagues • personal, reflective behaviour strategies • routine organisational methods for monitoring service delivery
Professional development activities may include:	• career planning/development • coaching, mentoring and/or supervision • formal/informal learning programs • internal/external training provision • performance appraisals • personal study • Recognition of Prior Learning • work experience/exchange/opportunities • workplace skills assessment

Unit Sector(s)

Unit sector	

ELEMENT	PERFORMANCE CRITERIA

Competency field

Competency field	Management and Leadership - Management

Co-requisite units

Co-requisite units		

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BSBWOR502B Ensure team effectiveness

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to facilitate all aspects of teamwork within the organisation. It involves taking a leadership role in the development of team plans, leading and facilitating teamwork and actively engaging with the management of the organisation. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

Application of the unit	This unit applies to managers and addresses the need for managers to facilitate work teams and to build a positive culture within work teams. The unit takes a systematic and planned approach to developing teams. It includes the soft skills as well as more structured approaches to the management of teams. At this level, work will normally be carried out within complex and diverse methods and procedures which require the exercise of considerable discretion and judgement, using a range of problem solving and decision making strategies.

Licensing/Regulatory Information

Not applicable.

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Establish team performance plan	1.1. ***Consult*** team members to establish a common understanding of team purpose, roles, responsibilities and ***accountabilities*** in accordance with organisational goals, plans and objectives 1.2. Develop ***performance plans*** to establish expected ***outcomes***, ***outputs***, ***key performance indicators*** and goals for work team 1.3. ***Support*** team members in meeting expected performance outcomes
2. Develop and facilitate team cohesion	2.1. Develop ***strategies*** to ensure team members have input into planning, decision making and operational aspects of work team 2.2. Develop ***policies and procedures*** to ensure team members take responsibility for own work and assist others to undertake required roles and responsibilities 2.3. Provide feedback to team members to encourage, value and reward individual and team efforts and contributions 2.4. Develop ***processes*** to ensure that issues, concerns and problems identified by team members are recognised and addressed
3. Facilitate teamwork	3.1. Encourage team members and individuals to participate in and to take responsibility for team activities, including communication processes 3.2. Support the team in identifying and resolving work performance problems 3.3. Ensure own contribution to work team serves as a role model for others and enhances the organisation's image for all ***stakeholders***
4. Liaise with stakeholders	4.1. Establish and maintain open communication processes with all stakeholders 4.2. Communicate information from ***line manager/management*** to the team 4.3. Communicate unresolved issues, concerns and problems raised by team members and follow-up with line manager/management and other relevant stakeholders 4.4. Evaluate and take necessary corrective action regarding unresolved issues, concerns and problems raised by internal or external stakeholders

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• communication skills to explain team goals, to address team conflict and to build an environment of trust • planning and organisational skills to keep team on track and focussed on work outcomes.
Required knowledge
• group behaviour • strategies for mentoring and coaching to informally guide and instruct team members • issue resolution • strategies for gaining consensus.

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Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the following is essential: • range of techniques that can be used to build work teams, strengthen communications in the team and resolve issues • methods for engaging with stakeholders and obtaining advice from outside the work team, to ensure team is focussed and on track • knowledge of group behaviour.
Context of and specific resources for assessment	Assessment must ensure: • access to appropriate documentation and resources normally used in the workplace.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • analysis of responses to case studies and scenarios • assessment of written reports • demonstration of team building techniques • direct questioning combined with review of portfolios of evidence and third party workplace reports of on-the-job performance by the candidate • observation of performance in role plays • review of performance plans developed for work team • review of policies and procedures developed to ensure team members take responsibility for own work.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • other units from the Diploma of Management.

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Consultation may refer to:	• conducting meetings, interviews, brainstorming sessions, email/intranet communications, newsletters or other processes and devices which ensure that all employees have the opportunity to contribute to team and individual performance plans • mechanisms used to provide feedback to the work team in relation to outcomes of consultation
Accountabilities may refer to:	• responsibilities as defined in position descriptions, codes of conduct/behaviour, duty statements or similar • statement of conduct outlining responsibilities/actions/performance
Performance plans may refer to:	• individual performance plans linked to team goals • team plans based on work assignments and responsibilities
Outcomes, ***outputs***, ***key performance indicators*** may refer to agreed:	• changes in work roles and responsibilities • improved individual and team, performance and participation • improvements to systems, operations • measures for monitoring and evaluating the efficiency or effectiveness of systems or services • quality standards and expectations • targets for productivity improvements such as reduced downtime, higher production levels, decreases in absenteeism • targets for training and development
Support may include:	• Coaching • Mentoring • Training and development opportunities • Clarification of roles and expectations

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RANGE STATEMENT	
	• Long term or short term plans • Meetings
Strategies may refer to:	• clarification of roles and expectations • electronic communication devices and processes, such as intranet and email communication systems, to facilitate input • long-term or short-term plans factoring in opportunities for team input • mentoring and 'buddy' systems to support team members in providing input • newsletters and briefings • training and development activities
Policies and procedures may refer to:	• organisational guidelines and systems that govern operational functions • procedures that detail the activities that must be carried out for the completion of actions and tasks • Standard Operating Procedures
Processes may refer to:	• brainstorming options with the team for addressing concerns • creating a matrix of issues and concerns and distributing for comment • discussions with individuals regarding their concerns • distributing drafts for comment with a range of options for resolution of concerns • training and development sessions
Stakeholders may include:	• Board members • business or government contacts • funding bodies • union/employee groups and representatives • work team
Line manager/management may refer to:	• chief executive officer • direct superior • other management representatives

Unit Sector(s)

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Unit sector	

Competency field

Competency field	Industry Capability - Workplace Effectiveness

Co-requisite units

Co-requisite units		

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CPCCOHS1001A Work safely in the construction industry

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to undertake Occupational Health and Safety (OHS) induction training within the construction industry.

It requires the ability to demonstrate personal awareness of OHS legislative requirements, and the basic principles of risk management and prevention of injury and illness in the construction industry.

Licensing requirements will apply to this unit of competency depending on the regulatory requirements of each jurisdiction.

Application of the Unit

Application of the unit

This unit of competency supports the attainment of the basic OHS knowledge required prior to undertaking designated work tasks within any of the sectors within the construction industry. The unit relates directly to the general induction training program specified by the *National Code of Practice for Induction for Construction Work* (ASCC 2007).

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units

Nil

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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify OHS legislative requirements.	1.1. Applicable ***OHS legislative requirements*** relevant to own work, role and responsibilities are identified and explained. 1.2. Duty of care requirements are identified. 1.3. Own responsibilities to comply with ***safe work practices*** are identified and explained.
2. Identify construction hazards and control measures.	2.1. Basic principles of risk management are identified. 2.2. ***Common construction hazards*** are identified and discussed. 2.3. ***Measures for controlling*** hazards and risks are identified.
3. Identify OHS communication and reporting processes.	3.1. OHS communication processes, information and documentation are identified and discussed. 3.2. Role of ***designated OHS personnel*** is identified and explained. 3.3. ***Safety signs and symbols*** are identified and explained. 3.4. Procedures and ***relevant authorities*** for reporting hazards, ***incidents*** and injuries are identified.
4. Identify OHS incident response procedures.	4.1. ***General procedures*** for responding to incidents and ***emergencies*** are identified and explained. 4.2. Procedures for accessing first aid are identified. 4.3. Requirements for the selection and use of relevant ***personal protective equipment*** are identified and demonstrated. 4.4. ***Fire safety equipment*** is identified and discussed.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- communication skills to:
  - clarify OHS legislative requirements

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REQUIRED SKILLS AND KNOWLEDGE

- verbally report construction hazards and risks
- ask effective questions
- relay information to others
- discuss OHS issues and information
- comprehension skills to:
  - explain the basic OHS legislative requirements which will be applicable to own work
  - explain the meaning of safety signs and symbols
  - identify common construction hazards
  - discuss the basic principles of risk management.

Required knowledge

Required knowledge for this unit is:

- applicable Commonwealth, State or Territory OHS legislation, regulations, standards, codes of practice and industry standards/guidance notes relevant to own work, role and responsibilities
- basic principles of risk management and assessment for construction work
- common construction hazards
- common construction safety signage and its meanings
- general construction emergency response and evacuation procedures
- general construction work activities that require licenses, tickets or certificates of competency
- general first aid response requirements
- general procedures for raising OHS issues
- general procedures for reporting OHS hazards, accidents, incidents, emergencies, injuries, near misses and dangerous occurrences
- general procedures for responding to hazards, incidents and injuries
- general workers' compensation and injury management requirements
- OHS hierarchy of controls
- OHS responsibilities and rights of duty holders, including:
  - persons in control of construction work/projects
  - employers and self-employed persons
  - supervisors
  - employees
  - designers
  - inspectors
  - manufacturers and suppliers
- own responsibilities to comply with safe work practices relating to:
  - housekeeping

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REQUIRED SKILLS AND KNOWLEDGE

- identification of hazards
- preventing bullying or harassment
- smoking
- use of amenities
- use of drugs and alcohol
- role of OHS committees and representatives
- types of common personal protective equipment and fire safety equipment
- types of OHS information and documentation.

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Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence must confirm personal awareness of the following: • applicable OHS legislative and safety requirements for construction work including duty of care • the range of common construction hazards and procedures for the assessment of risk and application of the hierarchy of control • OHS communication processes, information and documentation including the role of OHS committees and representatives, the meaning of common safety signs and symbols, and procedures for reporting hazards, incidents and injuries • general procedures for responding to incidents and emergencies including evacuation, first aid, fire safety equipment and PPE.
Context of and specific resources for assessment	• Resources must be available to support the program including participant materials and other information or equipment related to the skills and knowledge covered by the program. • It is recommended that the assessment tool designed specifically to support this unit of competency will provide consistency in assessment outcomes. • Where applicable, physical resources should include equipment modified for people with disabilities • Access must be provided to appropriate assessment support when required. • Assessment processes and techniques must be culturally appropriate, and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed • In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge.

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EVIDENCE GUIDE

	Questioning will be undertaken in such a manner as is appropriate to the oracy, language and literacy levels of the operator, any cultural issues that may affect responses to the questions, and reflecting the requirements of the competency and the work being performed.
Method of assessment	Assessment methods may include more than one of the following: • practical assessment • oral questioning • written test • work-based activities • simulated project based activity

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

OHS legislative requirements relate to:	• Australian standards • construction industry OHS standards and guidelines • duty of care • health and safety representatives, committees and supervisors • licences, tickets or certificates of competency • National Code of Practice for Induction Training for Construction Work • national safety standards • OHS and welfare Acts and regulations • safety codes of practice.
Duty of care requirements relate to:	• legal responsibility under duty of care to do everything reasonably practicable to protect others from harm

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RANGE STATEMENT

	• own responsibilities to comply with safe work practices, including activities that require licences, tickets or certificates of competency • relevant state OHS requirements, including employers and self-employed persons, persons in control of the work site, construction supervisors, designers, manufacturers and suppliers, construction workers, subcontractors and inspectors.
Safe work practices include:	• access to site amenities, such as drinking water and toilets • general requirements for safe use of plant and equipment • general requirements for use of personal protective equipment and clothing • housekeeping to ensure a clean, tidy and safer work area • no drugs and alcohol at work • preventing bullying and harassment • smoking in designated areas • storage and removal of debris.
Risk relates to:	• likelihood of a hazard causing injury or harm.
Principles of risk management include:	• assessing the risks involved • consulting and reporting ensuring the involvement of relevant workers • controlling the hazard • identifying hazards • reviewing to identify change or improvement.
Hazard relates to:	• any thing (including an intrinsic property of a thing) or situation with the potential to cause injury or harm.
Common construction hazards include:	• confined spaces • electrical safety • excavations, including trenches • falling objects • hazardous substances and dangerous goods • HIV and other infectious diseases • hot and cold working environments • manual handling • noise • plant and equipment

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RANGE STATEMENT

	• traffic and mobile plant • unplanned collapse • ultraviolet (UV) radiation • working at heights.
Measures for controlling risk to eliminate or minimise hazards in accordance with the hierarchy of control include:	• elimination • substitution • isolation • engineering control • administrative control • personal protective equipment.
OHS communication processes include:	• discussions with OHS representatives • OHS meetings • OHS notices, newsletters, bulletins and correspondence • OHS participative arrangements • processes for raising OHS issues • toolbox talks • workplace consultation relating to OHS issues and changes.
OHS information and documentation includes:	• accident and incident reports • Acts and regulations • Australian standards • codes of practice • construction documentation and plans • emergency information contact • evacuation plans • guidance notes • job safety analyses • labels • material safety data sheets (MSDS) • proformas for reporting hazards, incidents and injuries • reports of near misses and dangerous occurrences • risk assessments • safe work method statements • safety meeting minutes • site safety inspection reports.
Designated OHS personnel includes:	• first aid officers • OHS committee members

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RANGE STATEMENT

	• OHS representatives • supervisors.
Safety signs and symbols include:	• emergency information signs (e.g. exits, equipment and first aid) • fire signs (e.g. location of fire alarms and firefighting equipment) • hazard signs (e.g. danger and warning) • regulatory signs (e.g. prohibition, mandatory and limitation or restriction) • safety tags and lockout (e.g. danger tags, out of service tags).
Relevant authorities include:	• emergency services (e.g. police, ambulance, fire brigade and emergency rescue) • OHS regulatory authority • supervisor.
Incidents include:	• accidents resulting in personal injury or damage to property • near misses or dangerous occurrences which do not cause injury but may pose an immediate and significant risk to persons or property, and need to be reported so that action can be taken to prevent recurrence, for example: • breathing apparatus malfunctioning to the extent that the user's health is in danger • collapse of the floor, wall or ceiling of a building being used as a workplace • collapse or failure of an excavation more than 1.5 metres deep (including any shoring) • collapse or partial collapse of a building or structure • collapse, overturning or failure of the load bearing of any scaffolding, lift, crane, hoist or mine-winding equipment • damage to or malfunction of any other major plant • electric shock. • electrical short circuit, malfunction or explosion • uncontrolled explosion, fire or escape of gas, hazardous substance or steam • any other unintended or uncontrolled incident or event arising from operations carried on at a

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RANGE STATEMENT

	workplace.
General procedures for responding to incidents and emergencies include:	• basic emergency response (keep calm, raise alarm, obtain help) • evacuation • notification of designated OHS personnel and authorities • notification of emergency services (e.g. when and how) • referring to site emergency plans and documentation.
Emergencies include:	• chemical spill • fire • injury to personnel • structural collapse • toxic and/or flammable vapours emission • vehicle/mobile plant accident.
Personal protective equipment includes:	• aprons • arm guards • eye protection • gloves • hard hat • hearing protection • high visibility retro reflective vests • protective, well fitting clothing • respiratory protection • safety footwear • UV protective clothing and sunscreen.
Fire safety equipment includes:	• breathing apparatus • fire blankets • firefighting equipment.

Unit Sector(s)

Unit sector Construction

Co-requisite units

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Co-requisite units Nil

Functional area

Functional area

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CPCPCM2043A Carry out WHS requirements

Modification History

Changes to application, elements and performance criteria, required skills and knowledge, range statement and critical aspects
Not equivalent to CPCPCM2023A

Unit Descriptor

This unit of competency specifies the outcomes required to carry out work health and safety (WHS) requirements through safe work practices in a plumbing and services work environment.
The unit requires the performance of work in a safe manner through awareness of risks, work requirements and the planning and performance of safe work practices with concern for personal safety and the safety of others.
It includes the initial response to workplace emergencies; the safe use of electricity; the identification of hazardous materials, including asbestos; and compliance with legislated work safety practices.

Application of the Unit

This unit of competency supports safe work practices for the plumbing and services industry. Site location for work application may be either domestic or commercial and may be a new work site or an existing structure or fitting being renovated, extended, restored or maintained. It could also be conducted in an on or off-site workshop or at a customer's premises.
The unit does not cover the removal of asbestos, which is a licensed activity.

Licensing/Regulatory Information

In some jurisdictions, this unit of competency may form part of accreditation, licensing, legislative, regulatory or certification requirements.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Participate in workplace induction.	1.1	***Workplace induction*** is received.
		1.2	Location of emergency equipment is identified.
		1.3	Current workplace emergency and evacuation procedures are identified.
		1.4	Identify safe working conditions with employer.
		1.5	Identify employee and employer rights and responsibilities regarding safe working conditions.
2	Assess risks.	2.1	Hazards in the work area are identified, assessed and reported to designated personnel.
		2.2	WHS issues and risks in the work area are identified, assessed and reported to designated personnel.
		2.3	***Safe work practices***, procedures and instructions are followed.
		2.4	WHS, hazard, accident or incident reports are completed according to workplace procedures and ***statutory and regulatory authorities*** and legislation.
3	Identify hazards and hazardous materials on work site.	3.1	Hazardous materials on a work site are identified, secured and tagged using appropriate signs and symbols; and if appropriate, handled and used according to company and legislated procedures.
		3.2	Measures for controlling risks and construction hazards are applied effectively and immediately.

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		3.3	***Asbestos-containing materials (ACM) are identified*** on a work site ***and reported*** to designated personnel.
4	Plan and prepare for safe work practices.	4.1	Quality assurance requirements of company operations and safe work practices are identified and adhered to.
		4.2	Personal protective equipment (PPE) is selected, correctly fitted and used according to the requirements of the job.
		4.3	Tools and equipment are selected consistent with safe work practice requirements, checked for serviceability, and any faults are reported to supervisor.
		4.4	Required barricades, hoardings and signage are determined and erected at job location.
		4.5	Material safety data sheets (MSDS) are identified and applied.
		4.6	***Sustainability principles and concepts*** are observed when preparing for and undertaking work process.
5	Use safe work practices to carry out work.	5.1	Work is carried out safely and according to state or territory statutory requirements and company policy.
		5.2	***Safety hazards*** and common workplace accidents and incidents are identified in the course of work and reported according to policy.
		5.3	Industry, site and personal safety rights and responsibilities are applied.
		5.4	Prohibited tools and equipment in areas with identified asbestos are identified and isolated.
		5.5	Firefighting equipment is selected and used according to type of fire and correct operating procedures.
		5.6	Current site emergency and first aid procedures are followed.

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6	Maintain safety of self and others.	6.1	Safety signs, identified in terms of colour and shape, symbols and alarms, are adhered to.
		6.2	Hazardous chemicals and materials are identified, handled and stored, maintaining the safety to self, others and the environment.
		6.3	Incidents are reported according to legislative requirements and workplace procedures.
		6.4	Common causes of accidents in the industry are identified and prevention measures implemented in line with site induction.
		6.5	Site area is maintained to prevent incidents and accidents and protect self and others
7	Use electricity safely.	7.1	Safest supply and route for electrical supply are determined.
		7.2	Leads are supported and placed according to regulations.
		7.3	Power board visual check is conducted.
		7.4	Leads and equipment are checked for tags and visual damage.
		7.5	Electrical hazards are identified and reported.
8	Apply emergency response.	8.1	***Emergencies*** are identified.
		8.2	***Emergency response*** is provided according to company procedures and requirements.
		8.3	Details of actions taken are reported according to company procedures and requirements using appropriate communications.
9	Clean up work site area.	9.1	Work area is cleared and materials disposed of, reused or recycled according to legislation, regulations, codes of practice and job specifications.
		9.2	Tools and equipment are cleaned, checked, maintained and stored according to manufacturer recommendations

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and standard work practices.

9.3 Information is accessed and documentation completed according to workplace requirements.

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - complete written reports and other relevant documentation
  - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
  - use language and concepts appropriate to cultural differences
  - use and interpret non-verbal communication, such as hand signals
- initiative and enterprise skills to:
  - evaluate safety issues in the workplace and determine appropriate action
  - recognise WHS hazards, including asbestos, and take all opportunities to alleviate safety problems in a variety of construction work sites and environments
- initiative and enterprise skills to identify and report to appropriate personnel any faults in tools or materials
- literacy skills to read and interpret:
  - documentation from a variety of sources
  - MSDS
  - work safety procedures and instructions
- self-management skills to deal calmly and effectively with any potential safety problems and work closely with other team members and supervisors to ensure safe working conditions are maintained
- teamwork skills to work with others to action tasks and relate to people from a range of cultural and ethnic backgrounds and with varying physical and mental abilities
- technology skills to:
  - access and understand site-specific instructions in a variety of media
  - use mobile communication technology

Required knowledge

- asbestos management code relating to prevention of exposure
- job safety analysis (JSA) and safe work method statements (SWMS)
- manual handling techniques
- MSDS
- relevant legislation, regulations and workplace requirements relating to WHS, including hazard reduction and personal safety
- requirements for working in confined spaces and at height, including on rooves

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- tools and equipment prohibited from being used near identified ACM
- risk assessment
- safe work practices in normal working environment
- types, possible location and risks of ACM, including serpentine and amphobile groups and their use in common building materials
- workplace and equipment safety requirements
- workplace hazards and their precautions and reduction
- workplace response to emergencies

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

This unit of competency could be assessed in the workplace or a close simulation of the workplace environment providing that simulated or project-based assessment techniques fully replicate plumbing and services workplace conditions, materials, activities, responsibilities and procedures.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

- locate, interpret and apply relevant information, standards and specifications for applying safe work practices in the workplace
- apply safety requirements throughout the performance of work sequences, including electrical requirements and personal protective clothing and equipment
- apply sustainability principles and concepts
- undertake site and workplace induction
- correctly identify the location of ACM
- understand and apply policies and procedures for reporting presence of ACM to designated personnel
- assess workplace risks and interpret and apply safe work practices
- understand workplace requirements for emergency response, including evacuation procedures
- correctly locate and identify workplace firefighting and other safety equipment and appliances
- correctly select and use appropriate processes, tools and equipment
- safely complete all work to specification
- comply with regulations, standards and workplace instructions, procedures and processes, including reporting and documentation
- communicate and work effectively and safely with others.

Context of and specific resources for assessment

This competency is to be assessed using standard and authorised work practices, safety requirements and environmental constraints.

Assessment of essential underpinning knowledge will

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usually be conducted in an off-site context.

Assessment is to comply with relevant regulatory or Australian standards' requirements.

Resource implications for assessment include:

- an induction procedure and requirement
- realistic tasks or simulated tasks covering the minimum task requirements
- relevant specifications and work instructions
- tools and equipment appropriate to applying safe work practices
- support materials appropriate to activity
- workplace instructions relating to safe work practices and addressing hazards and emergencies
- material safety data sheets
- research resources, including industry-related systems information.

Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

Assessment methods must:

- satisfy the endorsed Assessment Guidelines of the Construction, Plumbing and Services Training Package
- include direct observation of tasks in real or simulated work conditions, with questioning to confirm the ability to consistently identify and correctly interpret the essential underpinning knowledge required for practical application
- reinforce the integration of employability skills with workplace tasks and job roles
- confirm that competency is verified and able to be transferred to other circumstances and environments.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further

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learning and practice, with a decision on competency only taken at the point when the assessor has complete confidence in the person's demonstrated ability and applied knowledge
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence.

Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of the candidate in relation to the competency being assessed.

Supplementary evidence of competency may be obtained from relevant authenticated documentation from third parties, such as existing supervisors, team leaders or specialist training staff.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Workplace induction may include:

- first aid officers and kits
- personnel competent and/or licensed in the safe handling of asbestos
- site induction work site locations
- specific site WHS issues
- specific site requirements.

Safe work practices are to be according to state and territory legislation and regulations and may include:

- handling of materials
- hazard control procedures and procedures for handling hazardous materials and substances
- PPE prescribed under legislation, regulations and workplace policies and practices
- use of firefighting equipment
- use of first aid equipment
- use of tools and equipment
- workplace environment and safety.

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Statutory and regulatory authorities include:	• commonwealth, state or territory, and local authorities administering applicable Acts, regulations and codes of practice.
Identifying and reporting asbestos-containing materials:	• includes recognising common types of ACM that may be found in construction materials and buildings • covers asbestos rope/fabrics, asbestos cement sheeting, asbestos cement piping and lagging on pipes, bituminous waterproof membrane, millboard, asbestos flues, sheeting under ceramic or vinyl floor or wall tiles in wet areas • involves reporting ACM to person in control of the workplace as set out in the relevant Asbestos Management Code.

Sustainability principles and concepts:	• cover the social, economic and environmental use of resources to meet current and future needs
	• may include:
	  • selecting appropriate components and material
	  • choosing efficient products
	  • using material efficiently
	  • storing and disposing of hazardous material to ensure minimal environmental impact.

Safety hazards may include:	• hazards and risks associated with tools and equipment • inflammable materials and fire hazards • lifting practices • lighting, gases, electricity and water • spillage, waste and debris • toxic and hazardous substances • working at heights • working in confined spaces.
Emergencies may include:	• accidents • fires • injuries • sudden illness.

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Emergency response may include:

- common site signs
- equipment tags
- facility or location signs
- safety barricades and warning signs
- site direction
- traffic signs
- workplace evacuation involving staff and customers.

Unit Sector(s)

Functional area

Unit sector Plumbing and services

Custom Content Section

Not applicable.

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CPCPMS3035A Install and test ducting systems

Modification History

Prerequisite unit changed
Changes to performance criteria, required skills and knowledge, range statement and critical aspects
Not equivalent to CPCPMS3015A

Unit Descriptor

This unit of competency specifies the outcomes required to install and test ducting systems used for ventilation systems, heating and/or cooling systems, and exhaust systems.

Application of the Unit

Site location for work application may be either domestic or commercial and may be a new work site or an existing structure being renovated, extended, restored or maintained.

Licensing/Regulatory Information

In some jurisdictions, this unit of competency may form part of accreditation, licensing, legislative, regulatory or certification requirements.

Pre-Requisites

CPCPCM2043A	Carry out WHS requirements

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Prepare for work.	1.1	Plans and specifications are obtained.
		1.2	***Work health and safety*** (WHS) and ***environmental requirements*** installing and testing ducting systems are adhered to throughout the work.
		1.3	***Quality assurance requirements*** are identified and adhered to according to workplace requirements.
		1.4	Tasks are planned and sequenced in conjunction with others involved in or affected by the work and ***statutory and regulatory authorities'*** requirements.
		1.5	***Tools and equipment***, including personal protective equipment, are selected and checked for serviceability.
		1.6	Work area is prepared to support efficient installation and testing of ducting systems.
2	Identify system requirements.	2.1	Quantity and type of ***ducting system materials***, including in-duct equipment, are calculated from plans, specifications and relevant ***information***.
		2.2	Allowances for fabrication or assembly are determined and transferred.
		2.3	***Materials*** are identified, ordered and collected according to workplace procedures.
		2.4	Materials and equipment are checked for compliance with standards, docket and order form, and acceptable condition and ***faults are reported***.

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3	Install and insulate duct system.	3.1	System is set out to comply with plans and specifications.
		3.2	Duct supports and fixings are positioned to comply with plans, specifications and manufacturer recommendations.
		3.3	Duct work is installed according to plans and specifications.
		3.4	Circumferential joints are assembled and sealed according to plans, specifications and manufacturer recommendations.
		3.5	Duct system is installed in specified location, without damage or distortion to surrounding environment or other services and according to standards.
		3.6	Insulation materials are fixed according to plans and specifications.
		3.7	Insulation materials are installed in specified location without damage to surrounding environment and according to plans, specifications, standards and manufacturer recommendations.
		3.8	***Diffusers and terminal devices*** are installed according to plans and specifications and with no damage to ceiling or finished surfaces.
		3.9	***Sustainability principles and concepts*** are applied throughout the installation.
4	Test duct work system.	4.1	Test requirements are determined from plans and specifications.
		4.2	Appropriate test equipment is selected for specified tests.
		4.3	Duct system is tested under pressure according to instructions and workplace procedures.
		4.4	Leak sources are identified and repaired using specified procedures and materials, to ensure correct flow operation.
		4.5	Details of test data are recorded in format required by

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			the specification.
5	Clean up.	5.1	Work area is cleared and materials disposed of, reused or recycled according to legislation, regulations, codes of practice and job specification.
		5.2	Tools and equipment are cleaned, checked, maintained and stored according to manufacturer recommendations and workplace procedures.
		5.3	Documentation is completed according to workplace requirements.

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - access information
  - determine requirements
  - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
  - follow instructions
  - report faults
  - use language and concepts appropriate to cultural differences
  - use and interpret non-verbal communication, such as hand signals
- initiative and enterprise skills to identify and report to appropriate personnel any faults in tools, equipment or materials
- literacy skills to:
  - complete workplace documentation
  - document ducting system tests
  - read and interpret:
    - documentation from a variety of sources
    - plans and specifications
- numeracy skills to apply measurements and calculations
- planning and organising skills to:
  - plan and sequence tasks with others
  - plan and set out work
- teamwork skills to work with others to action tasks and relate to people from a range of cultural and ethnic backgrounds and with varying physical and mental abilities
- technical skills to install, insulate and test ducting for ventilation, heating, cooling and exhaust systems, including in-duct equipment
- technology skills to:
  - access and understand site-specific instructions in a variety of media
  - use mobile communication technology

Required knowledge

- applicable Australian standards
- application of flow rates, pressure and volume principles to testing procedures

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- characteristics of materials used in the system being tested
- electrical and electronic principles and safety requirements
- job safety analysis (JSA) and safe work method statements (SWMS)
- levelling and alignment processes
- WHS regulations relevant to the work activity
- personal protective equipment requirements and use
- processes of installing, insulating and testing ducting
- SI system of measurement
- statutory requirements
- system types and identification of system components
- techniques for setting out, assembling, fixing and jointing duct work systems and components, including insulation and acoustic materials
- types of repairs for detected leaks in the duct work system

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

This unit of competency could be assessed in the workplace or a close simulation of the workplace environment providing that simulated or project-based assessment techniques fully replicate plumbing and services workplace conditions, materials, activities, responsibilities and procedures.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of:

- locating, interpreting and applying relevant information, standards and specifications to install and test small ducting systems
- applying safety requirements throughout the work sequence, including electrical safety requirements and the use of personal protective clothing and equipment
- given the plans and specifications, installing, insulating, testing and balancing from a plenum box or chamber a supply of heated air to three outlet grills; the installation shall incorporate hard and flexible duct work, including one transition piece and dampeners, ensuring:
    - application of sustainability principles and concepts
    - correct identification of requirements and details of proposed installation
    - correct selection and use of appropriate processes, tools and equipment
    - completing all work to specification
    - compliance with regulations, standards and organisational quality procedures and processes
    - communicating and working effectively and safely with others.

Context of and specific resources for assessment

This competency is to be assessed using standard and authorised work practices, safety requirements and environmental constraints.

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Assessment of essential underpinning knowledge will usually be conducted in an off-site context.

Assessment is to comply with relevant regulatory or Australian standards' requirements.

Resource implications for assessment include:

- an induction procedure and requirement
- realistic tasks or simulated tasks covering the minimum task requirements
- relevant specifications and work instructions
- tools and equipment appropriate to applying safe work practices
- support materials appropriate to activity
- workplace instructions relating to safe work practices and addressing hazards and emergencies
- material safety data sheets
- research resources, including industry-related systems information.

Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

Assessment methods must:

- satisfy the endorsed Assessment Guidelines of the Construction, Plumbing and Services Training Package
- include direct observation of tasks in real or simulated work conditions, with questioning to confirm the ability to consistently identify and correctly interpret the essential underpinning knowledge required for practical application
- reinforce the integration of employability skills with workplace tasks and job roles
- confirm that competency is verified and able to be transferred to other circumstances and environments.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning

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experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice, with a decision on competency only taken at the point when the assessor has complete confidence in the person's demonstrated ability and applied knowledge
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence.

Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of the candidate in relation to the competency being assessed.

Supplementary evidence of competency may be obtained from relevant authenticated documentation from third parties, such as existing supervisors, team leaders or specialist training staff.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Work health and safety is to be according to commonwealth, state and territory legislation and regulations and may include:

- handling of materials
- hazard control
- personal protective clothing and equipment prescribed under legislation, regulations and workplace policies and practices
- safe operating procedures, including recognising and preventing hazards associated with:
  - hazardous materials and substances
  - identifying and testing for electrical hazards
  - service lines
  - surrounding structures and facilities
  - trip hazards
  - use of tools and equipment
  - work site visitors and the public

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- working at heights
- working in proximity to others
- use of firefighting equipment
- use of first aid equipment
- workplace environment and safety.

Environmental requirements may include:

- clean-up protection
- waste management.

Quality assurance requirements may include:

- Environment Protection Authority (EPA)
- internal company quality assurance policy and risk management strategy
- International Standards Organisation
- site safety plan
- workplace operations and procedures.

Statutory and regulatory authorities include:

- commonwealth, state or territory, and local authorities administering applicable Acts, regulations and codes of practice.

Tools and equipment may include:

- duct lifter
- hand and power tools
- in-duct equipment, including:
  - fire dampers
  - noise attenuation fittings
  - volume control dampers
- ladders
- lifting and load shifting equipment, including:
  - chain blocks
  - elevated work platforms
  - forklifts
  - hand trolleys
  - hoists and jacks
  - rollers
  - scaffolds
- measuring equipment
- pittsburgh lock forming machine
- sheet metal rollers
- spot welders

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- test equipment, including:
  - manometers
  - micro-manometers.

Ducting system materials:

- may include:
  - diffusers
  - ducting
  - fixings and supports
  - in-duct equipment
  - insulation
  - joints
  - plenum box and chamber
  - terminal devices
- may be:
  - flexible
  - sheet metal
  - a combination.

Information may include:

- charts and hand drawings
- instructions issued by authorised organisational or external personnel
- manufacturer specifications and instructions
- material safety data sheets (MSDS)
- memos
- organisation work specifications and requirements
- plans and sketches
- regulatory and legislative requirements, particularly those pertaining to:
  - building codes
  - WHS and environmental requirements
  - plumbing regulations
- relevant Australian standards
- safe work procedures relating to installing and testing ducting heaters
- signage
- verbal, written and graphical instructions
- work bulletins
- work schedules, plans and specifications.

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Materials:

- may include:
- ducting:
  - fixings and supports
  - sheet metal:
    - flexible
    - combination
  - in-duct fittings:
    - plastic
    - sheet metal
  - insulation
- insulation and acoustic materials may be:
  - acoustic and non-acoustic materials
  - externally insulated
  - fibreglass tissue factory bonded to the insulation
  - flexible aluminium laminate fabric
  - perforated double-sided aluminium foil factory bonded to the insulation
  - perforated zincanneal or other metal sheet fixed in the duct so that continuous insulation is obtained
  - resin-bonded mineral wool or glass fibre in faced or unfaced semi-rigid batt or board form, weight 20 to 100kg and m^3
  - sheet materials
  - surface facings of PVC-coated fibreglass mesh factory bonded to the insulation
  - thermal and acoustic insulation for duct work and air handling equipment, handling air between 2 and 65°C
  - thermal insulation and sound absorption materials of resin-bonded mineral wool or glass fibre in unbound flexible blanket form, weight 20 to 65 kg and m^3.

Fault reporting:

- may be written or verbal
- is to be according to company's workplace procedures.

Diffusers and terminal devices may include:

- combined diffusers
- control devices
- cushion heads

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- grills
- light fittings
- outlets taken directly from duct and on flexible branch
- pressure-reducing devices
- registers
- variable air volume (VAV) boxes.

Sustainability principles and concepts:

- cover the current and future social, economic and environmental use of resources
- may include:
  - efficient use and recycling of material
  - efficient energy retention
  - ensuring integrity of ductwork system
  - selecting appropriate products and components to ensure minimal environmental impact.

Unit Sector(s)

Functional area

Unit sector Plumbing and services

Custom Content Section

Not applicable.

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CPPBDN5013A Develop and collaborate on building information models for small-scale building design projects

Modification History

New unit

Unit Descriptor

This unit of competency specifies the outcomes required to develop three-dimensional (3-D) models of small-scale building design projects covered by the Building Code of Australia (BCA), except construction Type A buildings, into true building information models (BIM).

It also covers adding and adjusting values of components of building designs, collaborating with consultants and contractors from other disciplines, working live within the model alongside other disciplines and creating project documentation using modelling software programs.

Application of the Unit

This unit of competency supports building designers who create and use BIMs to optimise productivity and enhance streamlining of the construction process through improved communication and collaboration with consultants and contractors involved in the construction life cycle.

Licensing/Regulatory Information

Work in this area must be completed according to relevant legislative, industry and organisational requirements, including occupational health and safety (OHS) policies and procedures.

Different states and territories may have regulatory mechanisms that apply to this unit. Users are advised to check for regulatory limitations.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Develop BIM project documentation	1.1	BIM project processes and schedules are planned and finalised in consultation with relevant project stakeholders.
		1.2	Procedures to provide accurate and reliable exchange of project models are developed according to ***organisational and project requirements***.
		1.3	Project documentation is generated according to organisational and project requirements using outputs of appropriate functions of design technology tools.
2	Develop a BIM project	2.1	Information **relating to *small-scale building design projects*** is analysed and applied to plans for BIM development.
		2.2	3-D models are created according to organisational and project requirements and software operation instructions using appropriate ***design technology tools***.
		2.3	***Building design data*** is embedded in project model ***objects*** to allow collaboration, integration and generation of required project documentation.
		2.4	BIM is checked and tested according to organisational and project requirements to confirm accuracy and functionality.
3	Exchange and collaborate on project models	3.1	Transfer of BIM files is tested according to organisational procedures to ensure integrity of format and data is retained on receipt.
		3.2	BIMs are provided to other consultants or contractors for addition of specialist data according to project

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requirements and data sharing protocols.

3.3 BIMs or BIM data provided by other consultants or contractors are imported or linked and checked for integrity according to project and organisational requirements.

3.4 BIMs are amended and manipulated live in collaboration with other contractors and consultants operating within the same model.

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- administration and management skills to:
  - develop process map, task list and schedule for BIM implementation
  - implement and manage standards
  - manage projects and documents
  - manage time, including planning and prioritising work
- analytical and problem-solving skills to:
  - develop innovative ideas and designs
  - select cost-effective products and materials that contribute to sustainable development
  - work out optimum compliant and cost-effective design solutions
- interpersonal skills to interact with clients and other stakeholders, including planning and regulatory personnel and technical experts
- language, literacy and numeracy skills to:
  - communicate with clients and contacts
  - estimate costs
  - interpret and apply complex information, including legislation, regulations, and codes and standards
  - present design options to clients
- technical skills to:
  - produce accurate design documentation and hand drawings
  - apply compliance requirements, including drawing standards
  - design from a brief
  - plan and carry out design, including visualising spaces, form, shapes and light
- technology skills to use information technology, BIM technologies and relevant software

Required knowledge

- architectural styles and terminology
- basic principles of structural engineering
- building designers' duty of care to ensure quality and safety of designs
- benefits and challenges of adopting a BIM approach to design production and documentation
- contextual and site constraints
- conventional and sustainable construction materials and methods, including their

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application, behaviour, characteristics, performance and interactions with other materials
- design development and approval processes, and implications of changes to design at each stage
- design drawing and representation methods
- design technology's built-in tools and networking tools required to maintain two or more disciplines in a single project model within a local area network (LAN)
- tools required to manage a project with two or more disciplines across a wide area network (WAN)
- hazards of site, materials, construction practices and building use over life cycle
- key features of building life cycles
- legislation, codes and standards relevant to sustainable design requirements for small-scale building design projects
- organisational scope of business, service levels and fees
- planning processes and requirements
- pricing of resources
- principles of integrated project delivery
- principles of sustainable design
- project management strategies
- scientific and social principles of human interactions with the built environment
- tools required to create a realistic BIM implementation plan that responds to specific staff, financial and schedule constraints

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person should demonstrate the ability to:
	• produce interactive BIM projects for a range of small-scale building design projects in consultation with project team
	• collaborate on BIM projects with a range of stakeholders, including:
	  • integration of imported data
	  • live interoperations.

Context of and specific resources for assessment	Assessment of this unit: • must be in the context of the work environment • may be conducted in an off-site context, provided it is realistic and sufficiently rigorous to cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment

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	skills
	• must meet relevant compliance requirements.
	Resource implications for assessment include:
	• access to:
	  • suitable assessment venue and equipment
	  • suitable simulated or real opportunities and resources to demonstrate competence
	• assessment instruments.

Method of assessment	Assessment for this unit must verify the practical application of the required skills and knowledge, using one or more of the following methods: • written and/or oral assessment of the candidates required knowledge for the unit • observed, documented and/or firsthand testimonial evidence of the candidates • implementation of appropriate procedures and techniques for the safe, effective and efficient achievement of the required outcomes • identification of the relevant information and scope of the work required to meet the required outcomes • identification of viable options and the selection of options that best meet the required outcomes • consistently achieving the required outcomes.
Guidance information for assessment	This unit could be assessed on its own or in combination with other units relevant to the job function. Where applicable, physical resources should include equipment modified for people with disabilities. Access must be provided to appropriate learning and/or assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate,

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accessibility of the item, and local industry and regional contexts) may also be included.

Organisational and project requirements may include:	• communications protocols • file exchange formats • reporting requirements • schedule.

Small-scale building design projects:	• include buildings covered by the BCA, except construction Type A buildings
	• may be residential projects, such as:
	  • additions and renovations
	  • heritage restoration
	  • new buildings
	• may be commercial or industrial projects, such as:
	  • factories
	  • motels
	  • offices
	  • restaurants
	  • retail and service outlets
	  • warehouses.

Design technology tools may include:	• proprietary 3, 4 and 5-D modelling software, such as:
	  • Autodesk Architectural Desktop
	  • Autodesk Revit
	  • Bentley Architecture
	  • Graphisoft ArchiCAD
	  • VectorWorks ARCHITECT.

Building design data may include:	• details of compliance requirements, including those specified in:
	  • Australian standards
	  • client requirements
	  • design specifications
	  • legislation and regulations
	  • manufacturer specifications
	• dimensions
	• labour costs
	• material costs
	• material properties, such as:
	  • acoustic values
	  • energy efficiency
	  • fire resistance
	  • R-value and U-value
	  • strength.

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Objects may include:	• customised imports • imports from online object libraries • new objects created by the designer.

Unit Sector(s)

Building design

Custom Content Section

Not applicable.

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CPPFES2043A Prevent ozone depleting substance and synthetic greenhouse gas emissions

Modification History

Revised unit
Unit updated and equivalent to PRMPFES43A Prevent ozone depleting substance and synthetic greenhouse gas emissions

Unit Descriptor

This unit of competency specifies the outcomes required to identify and describe agreements, protocols, legislation, regulations, codes of practice and handling licences developed to reduce ozone layer depletion and global warming.

Application of the Unit

This unit of competency supports individuals responsible for:

- complying with legal, industry, regulatory and licensing requirements relating to ozone depleting substance (ODS) and synthetic greenhouse gas (SGG) extinguishing agents used in fire protection
- considering the impact of work practices in the fire protection industry on ozone layer depletion and global warming
- proposing changes to reduce the risk of accidental emmissions that contribute to ozone layer depletion and global warming.

Licensing/Regulatory Information

The unit supports one or more fire protection industry extinguishing agent handling licences (EAHL) prescribed under the Ozone Protection and Synthetic Greenhouse Gas Management Act 1989.
Different states and territories may have regulatory mechanisms that apply to this unit. Candidates are advised to check for regulatory limitations.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Apply rules and regulations to the use of ODS and SGG extinguishing agents.	1.1	Requirements of relevant ***rules and regulations*** are ***confirmed*** and applied to ***work procedures*** to prevent ODS and SGG emissions.
		1.2	***Compliance requirements are checked*** and ***action*** is taken according to organisational policies and procedures, ODS and SGG policies and procedures, and best practice requirements.
2	Identify ODS and SGG handling licences, trading authorisations and usage permits.	2.1	Types of ODS and SGG ***extinguishing agent handling licences***, licence requirements and ***entitlements of licensees*** are identified.
		2.2	Extinguishant trading authorisations are identified.
		2.3	Halon special permit usage requirements are identified.
3	Apply an understanding of ozone layer depletion and global warming.	3.1	Role and functions of ***ozone layer*** are identified and explained.
		3.2	Factors involved with, and effects of, ***global warming*** are identified and described.
		3.3	***ODS and SGG extinguishing agents*** used in fire protection industry are identified by type.
		3.4	***Effect of ozone depletion and global warming*** on human health, environment and fire protection industry work practices is described.
		3.5	Relevant fire protection industry ODS and SGG work practices are identified.

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3.6 Improvements to ODS and SGG work practices are identified and proposed to reduce the risk of accidental emmissions.

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- language, literacy and numeracy skills to:
  - communicate with others clearly and concisely, verbally and in writing
  - read and comply with work industry regulations and codes of practice
  - interpret information
- initiative and enterprise skills to:
  - seek advice on license requirements
  - apply understanding of ozone layer depletion and global warming to change and improve fire protection industry work practices
  - identify and act upon learning opportunities
- technology skills to use technology to access information

Required knowledge

- effect of ozone layer
- actions to take where a breach of ODS and SGG policies and procedures occurs
- effect of:
  - ODS and SGG emissions on ozone depletion and global warming
  - ozone depletion and global warming on environment and human health
- factors involved in global warming
- implications of not applying ODS and SGG legislative requirements to the workplace
- key features of:
  - legislation, regulations and standards applicable to ozone protection in the fire protection industry
  - fire protection industry codes of practice
- ODS and SGG substances used in the fire protection industry
- ODS and SGG EAHL features and requirements, authorisations and permit requirements
- relevant federal, state or territory legislation that affects organisational operations

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	This unit of competency could be assessed by oral or written questioning covering: • underpinning knowledge of the effects of ODS and SGG emissions and current arrangements • workplace examples of action taken to reduce risk of emissions and responses to potential or actual breaches of legislation.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the required skills and knowledge specified in this unit.
	In particular the person should demonstrate the ability to:
	• apply understanding of ozone layer depletion and global warming for:
	  • discussing the effect of ODS and SGG emissions on the ozone layer and global warming
	  • describing the impact of ozone depletion and global warming on human health and the environment
	  • assessing impact on fire protection industry work practices
	  • proposing changes to fire protection industry work practices to meet ODS and SGG legal requirements
	  • taking action to respond to potential and actual breaches of ODS and SGG regulations
	• locate, interpret and explain:
	  • ODS and SGG legal requirements for handling extinguishing agents in the fire protection industry
	  • EAHL types, associated responsibilities, usage permits and trading authorisations
	  • agreements, protocols, regulatory requirements, fire protection industry code of practice, and Australian standards relevant to EAHL.

Context of and specific resources for assessment	Assessment of essential underpinning knowledge may be conducted in an off-site context. It is to comply with relevant regulatory or Australian standards' requirements. Resource implications for assessment include: • assessment documentation • necessary legislation and regulatory documents, manuals, textbooks and other relevant documentation

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	• training and assessment record books.
Method of assessment	Assessment methods must: • satisfy the endorsed Assessment Guidelines of the Property Services Training Package • include direct observation of tasks in real or simulated work conditions, with questioning to confirm the ability to consistently identify and correctly interpret the essential underpinning knowledge required for practical application • reinforce the integration of employability skills with workplace tasks and job roles • confirm that competency is verified and able to be transferred to other circumstances and environments.
Guidance information for assessment	Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support. Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of the candidate in relation to the competency being assessed. This unit could be assessed on its own or in combination with other units relevant to the job function.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Rules and regulations may include:	• dangerous goods regulations • environmental regulations • fire protection industry codes of practice • licensing arrangements, such as EAHL • manufacturers' system manuals • ODS and SGG legislation, codes and regulations, including penalties and policing • OHS legislation, regulations and codes • other relevant legislation relating to fire protection equipment, including: • international shipping codes

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	• marine codes for different Australian States • requirements of Australian petroleum industry • relevant agreements and protocols • relevant Australian standards, such as: • AS 1851 Maintenance of fire protection systems and equipment • note: Australian standards are frequently revised and users must always check for currency and amendments • relevant federal, state and territory Acts, regulations and codes.
Requirements may be ***confirmed*** with:	• colleagues • managers • supervisors • team leaders.
Work procedures may include:	• assignment instructions • equipment manufacturers' requirements • instructions from colleagues, supervisor or manager • personal protective equipment requirements • reporting and documentation requirements • specific customer requirements.
Checking compliance requirements may include ensuring that:	• persons trading in ODS and SGG hold the appropriate trading authorisation or ODS and SGG permit • scope of work to be undertaken is covered by the appropriate license.
Action may include:	• advising customer • documenting non-compliance • making equipment safe • reporting, as required.
Types of ***extinguishing agent handling licence*** include:	• control systems installation, commissioning and decommissioning • fixed system installation and decommissioning • fixed system testing and maintenance • portable fire extinguisher maintenance • recovery, reclamation, fill and recycling • warehouse maintenance.
Entitlements of licensees include:	• portable fire extinguisher maintenance licence entitles holder: • to charge and recharge a portable fire extinguisher with non-ODS and SGG agent • note: a reclaim and refill licence is required to charge or recharge a portable extinguisher with ODS or SGG • repair the extinguisher valve • fixed system installation and decommissioning licence entitles

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	holder to:
	• install and decommission a gaseous fire-extinguishing system (fire protection equipment) including to:
	  • install and disconnect actuation devices (mechanisms) to and from container valves
	  • install and disconnect gaseous agent containers
	  • install and disconnect interconnections to other gaseous system containers
	  • install and disconnect ancillary equipment connections to manifold and pipework
	  • attach and remove transport equipment, such as valve outlet and actuator port caps, plugs and locking devices installed to prevent accidental discharge
	• commission actuation control devices set to operate and engage safety devices as needed and decommission these devices
	• fixed system testing and maintenance licence entitles holder to:
	• test and maintain a gaseous fire-extinguishing system (fire protection equipment), including to:
	  • test actuation release systems
	  • disconnect and reconnect actuation devices (mechanisms)
	  • disconnect and reconnect interconnections to other gaseous system containers
	  • disconnect and reconnect ancillary equipment connections from containers to manifold and pipework
	  • test actuation devices (mechanisms)
	  • perform tests and maintenance on any fire detection and alarm system, including any remote operation panel and actuation and control system that interfaces with or forms part of a gaseous fire-extinguishing system
	  • perform tests and maintenance on gaseous agent containers and ancillary equipment connections from containers to manifold and pipework
	• recovery, reclamation, fill and recycling licence entitles holder to:
	• recover, reclaim, fill and recycle an extinguishing agent into and from a fire extinguisher and gaseous fire-extinguishing system container, from and to a bulk agent container
	• warehouse maintenance licence entitles holder to:
	• monitor for leakage stocks of extinguishing agent bulk agent containers in a warehouse and, as needed, to transfer extinguishing agent from a leaking storage container
	• control systems installation, commissioning and

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	decommissioning licence entitles holder to: • install, commission and decommission a fire detection and alarm system, including any remote operation panel and actuation and control system that interfaces with or forms part of a gaseous fire-extinguishing system.
Ozone layer facts include:	• composed of ozone (O3), which is a form of oxygen in which the oxygen molecule contains three atoms of oxygen instead of the usual two • ozone forms less than 0.4 parts per million of the atmosphere • about 90% of ozone is in upper part of atmosphere (stratosphere) • most ozone is in the layer from 20 to 25 km above the earth's surface.
Global warming involves:	• carbon dioxide found in small quantities (about 350 parts per million) in the atmosphere • carbon dioxide trapping infra red (heat) radiation and warming the atmosphere – the greenhouse effect.

ODS and SGG extinguishing agents may include:
 	
Note list format:
product name (other names) use
 	
Check the latest amendments to the Ozone Protection and Synthetic Greenhouse Gas Management Act for the current list of ODS and SGG extinguishing agents.
	• ODS and SGG extinguishing agents **commonly** used in Australia:
	  • FM200 (FE-227 Heptafluoropropane, HFC-227ea) used as a total flooding extinguishing agent and as a replacement for Halon 1301
	  • Halon 1211 (BCF, Halon 1211 BCF, Bromochlorodifluoromethane) used as a streaming agent – requires a special permit in Australia
	  • Halon 1301 (BTM, Halon 1301 BTM, Bromotrifluoromethane) used as a total flooding agent – requires a special permit in Australia
	  • NAF-P-III (HCFC Blend C) used as a streaming agent
	  • NAF-P-IV (HCFC Blend E) used as a streaming agent
	  • NAF-S-III (HCFC Blend A) used as a total flooding agent
	  • SF6 (Sulfurhexafluoride) used as an inerting agent in sealed high voltage switchgear
	• ODS and SGG extinguishing agents **not commonly** used in Australia:
	  • Blitz III (HCFC Blend D) used in flooding systems
	  • CFC-11 (Trichlorofluoromethane) may be found as a propellant in some powder fire extinguishers (this product is banned in Australia but may be found on incoming foreign vessels)
	  • FC-2-1-8 (CEA-308) used in flooding systems
	  • FC-3-1-10 (CEA-410) used in flooding systems
	  • FC-5-1-14 (CEA-614) used as a streaming agent
	  • FE-13 (Trifluoromethane, HFC-23) used as a total flooding

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	agent • FE-241 (Chlorotetrafluoroethane, HCFC-124) used as a total flooding agent for non-occupied spaces and as a streaming agent • FE-25 (Pentafluoroethane, HFC-125) used in inerting and explosion suppression applications • FE-36 (Hexafluoropropane, HFC-236fa) used in portable fire extinguishers – is a replacement for Halon 1211 and Halon 1301 • FM100 (HBFC-22B1) used in portable fire extinguishers • Halon 2402 (Dibromotetrafluoroethane) limited use in military systems – requires a special permit in Australia • Halotron I (HCFC Blend B or HCFC-123) used as a total flooding agent and streaming agent • Halotron II (blend of HFC-143a and HFC-125) used as a total flooding agent and as a replacement for Halon 1301 • HCFC-22 (Chlorodifluoromethane) used as a propellant in some powder fire extinguishers (this product is banned in Australia but may be found on incoming foreign vessels) • HFC-134a (Unsymmetric tetrafluoroethane) used as a propellant in some powder fire extinguishers.

Effect of ozone depletion and global warming on human health and the environment may include:	• changes to work practices, including those in the fire protection industry
	• constraints on:
	  • aquatic ecosystems
	  • human immune system
	• increased:
	  • incidence of photochemical smog
	  • risk of:
	  • cataracts
	  • skin cancer
	  • inhibited growth of plants
	  • reduced production of agriculture.

Unit Sector(s)

Fire protection equipment

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Custom Content Section

Not applicable.

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HLTAID001 Provide cardiopulmonary resuscitation

Modification History

Release	Notes
Release 3	Updated mapping information. Equivalent outcome.
Release 2	Updated mapping information. Equivalent outcome.
Release 1	This version was released in *HLT Health Training Package release 1.0* and meets the requirements of the New Standards for Training Packages. Significant changes to elements and performance criteria Revised evidence requirements, including volume and frequency of assessment

Application

This unit of competency describes the skills and knowledge required to perform cardiopulmonary resuscitation (CPR) in line with the Australian Resuscitation Council (ARC) Guidelines.

This unit applies to all workers who may be required to provide CPR in a range of situations, include community and workplace settings.

Specific licensing requirements relating to this competency, including requirements for refresher training should be obtained from the relevant state/territory Work Health and Safety Regulatory Authority.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
Elements define the essential outcomes.	*Performance criteria specify the level of performance needed to demonstrate achievement of the element.*
1. Respond to an emergency situation	1.1 Recognise an emergency situation
	1.2 Identify, assess and minimise immediate hazards to health and safety of self and others
	1.3 Assess the casualty and recognise the need for CPR
	1.4 Seek assistance from emergency response services
2. Perform CPR procedures	2.1 Perform CPR
	2.2 Display respectful behaviour towards casualty
	2.3 Operate automated external defibrillator (AED) according to manufacturer's instructions

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ELEMENT	PERFORMANCE CRITERIA
Elements define the essential outcomes.	*Performance criteria specify the level of performance needed to demonstrate achievement of the element.*
3. Communicate details of the incident	3.1 Accurately convey incident details to emergency response services 3.2 Report details of incident to workplace supervisor as appropriate 3.3 Maintain confidentiality of records and information in line with statutory and/or organisational policies

Foundation Skills

The Foundation Skills described those required skills (language, literacy and numeracy) that are essential to performance.

- *Oral communication* – in order to make an accurate verbal report to supervisor and emergency response services

The remaining foundation skills essential to performance are explicit in the performance criteria of this unit.

Unit Mapping Information

No equivalent unit.

Links

www.cshisc.com.au - http://www.cshisc.com.au

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Assessment Requirements for HLTAID001 Provide cardiopulmonary resuscitation

Modification History

Release	Notes
Release 1	This version was released in *HLT Health Training Package release 1.0* and meets the requirements of the New Standards for Training Packages. Significant changes to elements and performance criteria. Revised evidence requirements, including volume and frequency of assessment

Performance Evidence

The candidate must show evidence of the ability to complete tasks outlined in elements and performance criteria of this unit, manage tasks and manage contingencies in the context of the job role.
There must be demonstrated evidence that the candidate has completed the following tasks at least once in line with state/territory regulations, first aid codes of practice, ARC guidelines and workplace procedures:

- conducted a hazard assessment and identified strategies to minimise risk
- demonstrated safe manual handling techniques
- assessed airway, breathing and responsiveness of casualty
- performed at least four minutes of uninterrupted CPR on both an adult and an infant resuscitation manikin placed on the floor, demonstrating the following techniques on each:
  - checking for response and normal breathing
  - recognising abnormal breathing
  - opening and clearing the airway
  - using correct hand location, compression depth rate in line with the ARC recommended ratio of compressions and ventilations
  - acting in the event of regurgitation or vomiting
  - following single rescuer procedure, including the demonstration of a rotation of operators with minimal interruptions to compressions
- followed the prompts of an Automated External Defibrillator (AED)
- provided an accurate verbal report of the incident
- responded to at least one simulated resuscitation scenario contextualised to the candidate's workplace/community setting.

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Knowledge Evidence

The candidate must be able to demonstrate essential knowledge required to effectively complete tasks outlined in elements and performance criteria of this unit, manage tasks and manage contingencies in the context of the work role. This includes knowledge of:

- state/territory regulations, first aid codes of practice and workplace procedures including:
  - ARC Guidelines relevant to the provision of CPR
  - safe work practices to minimise risks and potential hazards
  - infection control principles and procedures, including use of standard precautions
  - requirements for currency of skill and knowledge
- legal, workplace and community considerations, including:
  - need for stress-management techniques and available support following an emergency situation
  - duty of care requirements
  - respectful behaviour towards a casualty
  - own skills and limitations
  - consent
  - privacy and confidentiality requirements
  - importance of debriefing
- considerations when providing CPR, including:
  - airway obstruction due to body position
  - appropriate duration and cessation of CPR
  - appropriate use of an AED
  - chain of survival
  - standard precautions
- basic anatomy and physiology relating to:
  - absence of normal breathing
  - anatomy of the external chest
  - physiology relating to response/consciousness
  - upper airway anatomy and effect of positional change.

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Assessment Conditions

Skills must be demonstrated working individually:

- in an environment that provides realistic in-depth, industry-validated scenarios and simulations to assess candidates' skills and knowledge.

In addition, assessment resources must include:

- adult and infant resuscitation manikins in line with ARC Guidelines for the purpose of assessment of CPR procedures
- equipment, including:
- an Automated External Defibrillator (AED) training device.

Simulated assessment environments must simulate the real-life working environment where these skills and knowledge would be performed, with all the relevant equipment and resources of that working environment.

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors. In addition, assessors must hold:

- a current advanced first aid certificate

OR

- at least three years' experience as a health professional, nurse or emergency services provider

Links

Companion volumes from the CS&HISC website - http://www.cshisc.com.au

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HLTAID003 Provide first aid

Modification History

Release	Comments
Release 4.0	Updated mapping information. Equivalent outcome.
Release 3.0	Updated mapping information.
Release 2.0	Minor corrections to formatting to improve readability. Equivalent competency outcome.
Release 1.0	This version was released in *HLT Health Training Package release 1.0* and meets the requirements of the New Standards for Training Packages. Significant changes to elements and performance criteria, changes to scope of unit. New evidence requirements for assessment. Removal of prerequisite unit

Application

This unit of competency describes the skills and knowledge required to provide a first aid response to a casualty. The unit applies to all workers who may be required to provide a first aid response in a range of situations, include community and workplace settings.

Specific licensing requirements relating to this competency, including requirements for refresher training, should be obtained from the relevant state/territory Work Health and Safety Regulatory Authority.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
Elements define the essential outcomes.	*Performance criteria specify the level of performance needed to demonstrate achievement of the element.*
1. Respond in an emergency situation	1.1 Recognise an emergency situation
	1.2 Identify, assess and manage immediate hazards to health and safety of self and others
	1.3 Assess the casualty and recognise the need for first aid response
	1.4 Assess the situation and seek assistance from emergency response services where required
2. Apply appropriate first aid procedures	2.1 Perform cardiopulmonary resuscitation (CPR)
	2.2 Provide first aid in accordance with established first aid principles
	2.3 Display respectful behaviour towards casualty
	2.4 Obtain consent from casualty where possible
	2.5 Use available resources and equipment to make the casualty as comfortable as possible
	2.6 Operate first aid equipment according to manufacturer's instructions
	2.7 Monitor the casualty's condition and respond in accordance with first aid principles
3. Communicate details of the incident	3.1 Accurately convey incident details to emergency response services
	3.2 Report details of incident to workplace supervisor as appropriate
	3.3 Maintain confidentiality of records and information in line with statutory and/or organisational policies

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ELEMENT	PERFORMANCE CRITERIA
Elements define the essential outcomes.	*Performance criteria specify the level of performance needed to demonstrate achievement of the element.*
4. Evaluate own performance	4.1 Recognise the possible psychological impacts on self and other rescuers involved in critical incidents
	4.2 Participate in debriefing to address individual needs

Foundation Skills

The Foundation Skills described those required skills (language, literacy and numeracy) that are essential to performance.

- Oral communication – in order to make an accurate verbal report to emergency response services and workplace supervisor

The remaining foundation skills essential to performance are explicit in the performance criteria of this unit.

Unit Mapping Information

No equivalent unit.

Links

www.cshisc.com.au - http://www.cshisc.com.au

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Assessment Requirements for HLTAID003 Provide first aid

Modification History

Release	Comments
Release 1.1	Minor corrections to formatting to improve readability. Equivalent competency outcome.
Release 1.0	This version was released in *HLT Health Training Package release 1.0* and meets the requirements of the New Standards for Training Packages. Significant changes to elements and performance criteria, changes to scope of unit. New evidence requirements for assessment. Removal of prerequisite unit

Performance Evidence

The candidate must show evidence of the ability to complete tasks outlined in elements and performance criteria of this unit, manage tasks and manage contingencies in the context of the job role.
There must be demonstrated evidence that the candidate has completed the following tasks at least once in line with state/territory regulations, first aid codes of practice, Australian Resuscitation Council (ARC) guidelines and workplace procedures:

- conducted a hazard assessment and identified strategies to minimise risk
- demonstrated safe manual handling techniques
- assessed airway, breathing and responsiveness of casualty
- performed at least four minutes of uninterrupted CPR on both an infant resuscitation manikin and an adult resuscitation manikin placed on the floor, demonstrating the following techniques on each:
  - checking for response and normal breathing
  - recognising abnormal breathing
  - opening and clearing the airway
  - using correct hand location, compression depth rate in line with the ARC recommended ratio of compressions and ventilations
  - acting in the event of regurgitation or vomiting
  - following single rescuer procedure, including the demonstration of a rotation of operators with minimal interruptions to compressions
- followed the prompts of an Automated External Defibrillator (AED)
- conducted a verbal secondary survey
- applied first aid procedures for the following:
  - allergic reactions

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  - anaphylaxis
  - asthma
  - basic wound care
  - severe bleeding
  - burns
  - cardiac arrest
  - choking and airway obstruction
  - convulsions
  - envenomation (using pressure immobilisation)
  - fractures, sprains and strains (using arm slings, roller bandages or other appropriate immobilisation techniques)
  - poisoning
  - respiratory distress
  - shock
- provided an accurate verbal report of the incident
- responded to at least two simulated emergency scenarios contextualised to the candidate's workplace/community setting.

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Knowledge Evidence

The candidate must be able to demonstrate essential knowledge required to effectively complete tasks outlined in elements and performance criteria of this unit, manage tasks and manage contingencies in the context of the work role. This includes knowledge of:

- state/territory regulations, first aid codes of practice and workplace procedures including:
  - ARC Guidelines relevant to provision of CPR and first aid
  - safe work practices to minimise risks and potential hazards
  - infection control principles and procedures, including use of standard precautions
  - requirements for currency of skill and knowledge
- legal, workplace and community considerations including:
  - need for stress-management techniques and available support following an emergency situation
  - duty of care requirements
  - respectful behaviour towards a casualty
  - own skills and limitations
  - consent
  - privacy and confidentiality requirements
  - importance of debriefing
- considerations when providing first aid including:
  - airway obstruction due to body position
  - appropriate duration and cessation of CPR
  - appropriate use of an AED
  - standard precautions and infection control
- principles and procedures for first aid management of the following scenarios:
  - abdominal injuries
  - allergic reactions
  - anaphylaxis
  - bleeding control
  - burns
  - cardiac conditions
  - choking and airway obstruction
  - cold and crush injuries
  - diabetes
  - dislocations
  - drowning
  - envenomation
  - environmental impact (including hypothermia, hyperthermia, dehydration and heat stroke)
  - epilepsy
  - eye and ear injuries
  - fractures
  - head, neck and spinal injuries
  - minor skin injuries
  - needle stick injuries
  - poisoning and toxic substances

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  - respiratory distress, including asthma and other respiratory conditions
  - seizures
  - severe allergic and anaphylactic reactions
  - shock
  - soft tissue injuries
  - unconsciousness, abnormal breathing or not breathing
- basic anatomy and physiology relating to:
  - absence of normal breathing
  - anatomy of the external chest
  - physiology relating to response/consciousness
  - upper airway anatomy and effect of positional change
  - anatomy and physiology considerations in provision of first aid for specified conditions

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Assessment Conditions

Skills must be demonstrated working individually:

- in an environment that provides realistic in-depth, industry-validated scenarios and simulations to enable assessment of candidates' skills and knowledge.

Assessment resources must include:

- adult and infant resuscitation manikins in line with ARC Guidelines for the purpose of assessment of CPR procedures
- first aid equipment including
  - roller bandages
  - triangular bandages cloth
  - trauma dressings
  - placebo bronchodilator and spacer device
  - adrenalin auto-injector training device
  - an AED training device
  - emergency rescue blanket
  - workplace first aid kit.

Simulated assessment environments must simulate the real-life working environment where these skills and knowledge would be performed, with all the relevant equipment and resources of that working environment.

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors.

In addition, assessors must hold:

- a current advanced first aid certificate

OR

- at least three years' experience as a health professional, nurse or emergency services provider.
-

Links

Companion volumes from the CS&HISC website - http://www.cshisc.com.au

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ICTTEN2207A Install and configure a home or small office network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required for entry level networking support to establish a small office or home office (SOHO) internet connected PC network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to a home office or small business requiring the use of network and internetwork connectivity. It also applies to small networks with simple internet protocol (IP) addressing schemes that share a limited range of resources. Physical connections may be wired or wireless and simple firewall security employed. Relevant job roles include installer of SOHO IP networks, network technician, SOHO network support and digital home integrator.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for the installation of a home or small office network	1.1. Prepare for given work confirming site specific occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the network and ***network resources*** from job briefs or appropriate personnel 1.4. Select and obtain ***personal computer system*** and ***network device*** requirements according to ***enterprise procedures*** 1.5. Obtain operating instructions, manuals, hardware and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the work site
2. Install and troubleshoot a home or small office network	2.1. Set up personal computer systems according to manufacturer's specifications and enterprise procedures 2.2. Set up, configure and share network resources between network devices 2.3. Determine ***network addressing scheme*** for network connectivity and confirm using ***calculations*** 2.4. Troubleshoot network and internet connectivity according to manufacturer's specifications and enterprise procedures 2.5. Identify security threats and initiate control measures according to enterprise procedures
3. Complete and document network installation	3.1. Restore worksite to safe condition according to established safety procedures 3.2. Record and store ***essential installation information*** according to enterprise procedures 3.3. Notify appropriate personnel about the completion of the task according to enterprise procedures 3.4. Notify customer and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customers and peers to achieve outcomes
- literacy skills to read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data and perform calculations to confirm network connectivity
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot common network problems according to help desk procedures
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - configure the security features of a network to minimise risk of any security breach
  - correctly use tools and equipment
  - design a small computer network using appropriate protocols, tools and models to provide a specified range of services
  - develop a security policy for a small computer network
  - install, configure and maintain basic wired and wireless computer networks, systems and peripherals
  - plan, select, install and configure network operating systems

Required knowledge

- correct usage of tools and equipment
- enterprise OHS procedures
- basic computer systems and network operating systems
- computer networking principles (wired and wireless)
- network addressing systems (basic)
- network services and associated network models and protocols
- network security management
- troubleshooting procedures

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement OHS workplace procedures and practices • plan the installation of an internet connected network • set up and configure wired and wireless networks with simple addressing schemes • troubleshoot network and internet connectivity • set up resource sharing • deploy simple firewall network security.
Context of, and specific resources for assessment	Assessment must ensure: • a site where installation of a SOHO network may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and configuring a SOHO network • direct observation of the candidate deploying simple firewall network security • oral or written questioning to assess knowledge of personal computer systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2208A Install and configure a small to medium business network. Aboriginal people and other people from a non-English

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EVIDENCE GUIDE	
	speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS requirements may include:	• awards provisions • hazardous substances and dangerous goods code • legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may	• dust

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RANGE STATEMENT	
include:	• excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer/client • manager • network manager • site engineer • supervisor.
Network resources may include:	• dynamic host configuration protocol (DHCP) server • domain name system (DNS) server • files • software • web browser.
Personal computer system may include:	• interface cards • media connections • operating system • PC hardware • peripheral devices.
Network device may include:	• hub • network attached storage device • print server • router (wired or wireless) • switch.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Network addressing scheme may	• dynamic addressing

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RANGE STATEMENT	
include:	• static addressing • sub-net addressing.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.
Essential installation information may include:	• installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN2208A Install and configure a small to medium business network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to establish and support a small to medium business network capable of providing wide area network (WAN) connectivity and common web internet services. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to small and medium size businesses requiring the use of wired network connectivity. It also applies to networks that employ subnet addressing and provide internet service provider (ISP) services over a secure network. Relevant job roles include subject matter expert (SME) internet protocol (IP) network installer, network technician, SME network support and SME network administrator.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for the installation of a small to medium enterprise network	1.1. Prepare for given work confirming site specific occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the business network and ***network resources*** from job briefs or appropriate personnel 1.4. Select and obtain computer system and ***network device*** requirements according to ***enterprise procedures*** 1.5. Obtain operating instructions, manuals, hardware and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the work site
2. Install and configure a small to medium enterprise network	2.1. Set up ***wired infrastructure*** according to manufacturer's specifications and enterprise procedures 2.2. Set up and configure resource sharing on a network server 2.3. Install WAN connection and ISP services and configure according to enterprise procedures 2.4. Troubleshoot network and internet connectivity according to manufacturer's specifications and enterprise procedures 2.5. Implement data backup and disaster recovery measures according to enterprise procedures
3. Complete and document network installation	3.1. Restore worksite to safe condition according to established safety procedures 3.2. Record and store ***essential installation information*** according to enterprise procedures 3.3. Notify appropriate personnel about the completion of the task according to enterprise procedures 3.4. Notify customer and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customers and peers to achieve outcomes
- literacy skills to:
  - develop network documentation and maintain network records
  - read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot common network problems according to help desk procedures
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - determine business needs of a small ISP
  - identify customer requirements and provide help desk support
  - implement WAN services to the internet
  - install, configure and troubleshoot networking devices
  - instigate data backup and disaster recovery procedures
  - modify and translate network and port addresses to establish connectivity
  - plan wired network infrastructure
  - use router testing methodologies to verify a given configuration

Required knowledge

- correct usage of tools and equipment
- data backup services and procedures
- enterprise OHS procedures
- ISP services
- network device configuration
- network models and topologies
- subnet addressing
- troubleshooting procedures

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REQUIRED SKILLS AND KNOWLEDGE
• WAN services and ISP responsibilities

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement OHS workplace procedures and practices • plan the installation of a network that uses subnet addressing and provides ISP services • set up and configure wired infrastructure • troubleshoot local network and WAN connectivity and services • configure resource sharing on a network server • provide network data backup and disaster recovery.
Context of, and specific resources for assessment	Assessment must ensure: • a site where installation of a small to medium business network may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and configuring a small to medium business network • direct observation of the candidate providing network data backup and disaster recovery • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN2207A Install and configure a home or small office network.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods code • legislation • local safe operation procedures • material safety management systems • protective equipment.

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RANGE STATEMENT	
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• client • customer • manager • network manager • site engineer • supervisor.
Network resources may include:	• dynamic host configuration protocol (DHCP) server • domain name system (DNS) server • files • software • web browser.
Network device may include:	• router • server • switch • wired infrastructure for a small to medium size business.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Wired infrastructure may include:	• connectors and cabling • copper cables • distribution frames • fibre cables.

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RANGE STATEMENT	
Essential installation information may include:	• installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN2209A Build and maintain a secure network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to build a simple and secure wired local area network (LAN) or wide area network (WAN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to simplified network environments demonstrating the use of network and internetwork connectivity using a range of client server applications and services. Relevant job roles include installer of internet protocol (IP) networks, WAN and LAN network technician and WAN and LAN network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare to build a LAN or WAN	1.1. Prepare for given work confirming site-specific occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine network design specification from job briefs or appropriate personnel 1.4. Determine ***network addressing scheme*** for network connectivity and confirm using ***calculations*** 1.5. Select and obtain ***network hardware*** according to ***established procedures*** 1.6. Obtain operating instructions, manuals, hardware and software testing methodologies 1.7. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Build and verify a network	2.1. Establish connections between network hardware according to manufacturer's specifications and established procedures 2.2. Verify network routing and switching to conform to network design specification 2.3. Set up, configure and share ***network resources*** between network devices
3. Monitor network performance and troubleshoot network	3.1. Monitor network traffic and assess performance metrics against manufacturer's specifications and established procedures 3.2. Identify security threats and initiate control measures according to enterprise procedures 3.3. Troubleshoot network and internet connectivity according to manufacturer's specifications and enterprise procedures
4. Complete and document network build	4.1. Restore work site to safe condition according to established safety procedures 4.2. Record and store network schematics and network addressing scheme 4.3. Notify appropriate personnel about the completion of the task 4.4. Notify customer and obtain sign off

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customers and peers to achieve outcomes
- literacy skills to:
  - read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data and devise addressing schemes
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot common network problems according to help desk procedures
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - configure applications and verify their connection to provide network services
  - configure interfaces, test and verify correct functionality
  - configure the security features of a network to minimise risk of security breach
  - plan, build, configure, test and analyse the performance of a network
  - use appropriate tools to develop and test network addressing
  - use appropriate tools to monitor and analyse the routing of packets in a network

Required knowledge

- enterprise OHS procedures
- internet and computer network communication
- network addressing schemes
- open systems interconnect (OSI) and transmission control protocol (TCP)/IP model
- planning the cabling of Ethernet networks
- seven layer OSI model
- tool and equipment correct usage
- troubleshooting procedures

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • implement OHS workplace procedures and practices • develop a network addressing scheme • determine required network components to build the network • plan, build, configure, test and analyse the performance of a network • troubleshoot network problems.
Context of, and specific resources for assessment	Assessment must ensure: • a site where building and maintenance of a secure network may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate building configuring and testing a secure wired LAN or WAN network • direct observation of the candidate troubleshooting network problems • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN4212A Apply advanced routing protocols to network design • ICTTEN4213A Configure and troubleshoot advanced network switching

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EVIDENCE GUIDE	
	• ICTTEN4214A Install and maintain a wide area network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods code • legislation

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RANGE STATEMENT	
	• local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
Network addressing scheme may include:	• dynamic • static • subnet.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.
Network hardware may include:	• cables • routers • switches.

Established procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

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RANGE STATEMENT	
Network resources may include:	• dynamic host configuration protocol (DHCP) server • domain name system (DNS) server • files • software • web browser.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN3056A Install telecommunications network equipment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to effectively install and test telecommunications network equipment. It includes processes for checking plans, obtaining and proper handling of equipment and supplies. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	Field officers, technicians or technical supervisors employed by carriers, contractors or other service providers apply the skills and knowledge in this unit. This unit may apply to switching, transmission and radio networks and various transmission paths, including cable, optical fibre, radio, microwave and satellite. The unit applies to installation of new, additional and replacement equipment.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan for installation of telecommunications network equipment	1.1. Prepare for given work according to ***relevant occupational health and safety*** (***OHS***) ***and environmental requirements*** 1.2. Notify customer to arrange site access if necessary 1.3. Assess existing and potential site ***hazards*** 1.4. Verify location of proposed ***network equipment*** installation according to the appropriate plans obtained from ***authorised personnel*** 1.5. Develop installation plans to ensure minimal disruption to the workplace and according to ***relevant legislation***, ***codes***, ***regulations and standards*** 1.6. Obtain ***tools*** and ***test equipment*** required for safe work practice 1.7. Notify affected parties of possible network outage if required
2. Install network hardware and cabling	2.1. Install network equipment according to the plan and manufacturer's instructions using safe industry practices 2.2. Insert equipment cards and modules 2.3. Install all ***interconnecting cables*** to specification 2.4. Confirm service interruption is within limits agreed with the customer 2.5. Document all installation drawings for the customer
3. Install equipment accessories	3.1. Install alarms according to instruction manuals and to specification 3.2. Install operations administration and maintenance system according to specification 3.3. Install communication facilities for operational staff according to specification, taking into account any special needs of the site and the operational staff 3.4. Install operator communication facilities according to needs and to specification
4. Configure and test the system	4.1. Install software and configuration instructions according to system specifications if required 4.2. ***Test*** to verify the system performance according to customer requirements

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ELEMENT	PERFORMANCE CRITERIA
	4.3. Recommend any possible changes and confirm with customer 4.4. Record all test results
5. Clean up worksite and complete documentation	5.1. Remove and dispose of installation waste and debris from worksite according to environmental requirements 5.2. Restore changes made to the work area during installation to the customer's satisfaction 5.3. Complete all installation documents and present to the customer 5.4. Declare asset ready for commissioning and integration 5.5. Notify the customer and obtain signoff

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- analytical skills to:
  - interpret test equipment settings and readings
  - interpret design specifications including:
    - circuit diagrams
    - plans
    - specifications
- communication skills to liaise with customers to ensure requirements are known and can be met within timeframes
- literacy skills to interpret technical specifications and related documentation
- numeracy skills to make calculations and necessary calibration changes
- planning and organisation skills to make site access and equipment delivery arrangements
- problem solving to account for unexpected faults or equipment incompatibilities
- technical skills to:
  - apply antistatic techniques for material and equipment handling
  - correctly handle, connect and calibrate test equipment
  - install cables including:

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REQUIRED SKILLS AND KNOWLEDGE
• appropriate cable separation • minimum bending radii • provision of spare length • terminate cables including: • stripping • conductor identification and fanning • cleaning of optical fibres connectors • provision of spare length • use hand tools for mounting and securing equipment
Required knowledge
• cabling types, connectors and cabling structures • connections to carrier infrastructure or equipment • electrical and or optical properties to be measured • overview knowledge of network and transmission equipment • power requirements and electrical safety • typical performance parameters and faults that may be encountered in customer equipment and related connection and transmission media • various test equipment types suitable for tests to be made • waste handling and environmental compliances in its disposal

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan and install network hardware and cabling according to equipment/system manuals and specifications • configure and test installation • verify cable continuity • comply with all related OHS requirements and work practices.
Context of and specific resources for assessment	Assessment must ensure: • sites where installation of telecommunications network equipment may be conducted • use of network testing equipment currently used in industry • relevant regulatory and equipment documentation that impact on telecommunications network equipment installation activities.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing telecommunications network equipment • review of reports completed by the candidate for different scenarios and situations • oral or written questioning to assess knowledge of planning, types of systems.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTSUS4184A Install and test power saving hardware • ICTTEN4051A Install configuration programs on PC based customer equipment • ICTTEN4198A Install, configure and test an internet

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EVIDENCE GUIDE	
	protocol (IP) network • ICTTEN4199A Install, configure and test a router. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant OHS and environmental requirements may relate to:	• identifying other services including power and gas • need for decommissioning and isolate worksite and lines prior to commencement

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RANGE STATEMENT	

	• personal protective clothing:
	  • earmuffs
	  • gloves:
	  • plastic
	  • rubber
	  • leather
	  • head protection
	  • kneepads
	  • masks
	  • protective suits
	  • safety boots
	  • safety glasses
	• safety equipment:
	  • flashing lights
	  • gas and other hazard detection equipment
	  • safety barriers
	  • trench guards
	  • warning signs and tapes
	  • witches hats
	• safe working practices, such as the safe use and handling of:
	  • asbestos
	  • chemicals
	  • materials
	  • tools and equipment
	  • work platforms
	• special access requirements
	• suitable light and ventilation
	• environmental considerations:
	  • clean-up protection
	  • stormwater protection
	  • waste management.

Hazards may include:	• building debris • earth potential rise (EPR) • glass fibre • live power lines • manual handling • mud and water

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RANGE STATEMENT	
	• natural and other gas build up • needle stick injury • optical cable • radio frequency (RF) equipment emitting radiation • remote power feeding services • vermin.

Network equipment may include:	• customer premises equipment (CPE) equipment:
	  • cable/Pay TV
	  • closed circuit TV (CCTV)
	  • free to air TV
	  • intercom
	  • office equipment
	  • security equipment
	• computer network:
	  • gateways
	  • network managers
	  • router
	  • servers
	  • switches
	  • voice over internet protocol (VoIP)
	  • wireless LAN
	• multiplexing and radio:
	  • fixed
	  • mobile
	• optical equipment
	• RF
	• switching
	• transmission
	• voice switching units.

Authorised personnel may include:	• consultant • contractor • network administrator • project manager.
Relevant legislation, ***codes***, ***regulations and standards*** may include:	• Australian Communications and Media Authority (ACMA) regulations relating to functional earthing • ACMA standards TS 14

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RANGE STATEMENT	
	• AS Communications Cabling Manual (CCM) Volume 1 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian Construction Industry Forum (ACIF) standards and codes • Australian standards applying to radiation hazards • AS/NZS/ISO 9001:2000 • cabling security codes and regulations • environmental protection acts • heritage legislation • International Telecommunications Union (ITU) recommendations • OHS Acts • State/Territory and Federal environment Acts • technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.
Tools may include:	• anti-static testers • cable strippers • cable testers • cable tie tensioners • crimpers • hammers • humidity and temperature testers • insulation displacement tools • jigsaws • level • load testers • mechanical lifts/hoists • pliers • power tools • screwdrivers • soldering irons

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RANGE STATEMENT	
	• spanners • tape measures • tension wrenches • termination tools • trolleys • wire strippers.
Test equipment may include:	• adaptors • analog transmission measuring sets • communication system analysers • digital analysers • error meter • frequency measurer • global system for mobile communication (GSM) spectrum frequency synthesiser • lap top computer • laser source • level meter • light meter • microwave link analyser • modulator tester • multimeters • optical attenuators • optical fibre power meters • oscillator • oscilloscopes • optical time domain reflectometer (OTDR) • pattern generators • power meters • RF band noise measurer • RF microwave test sets • RF sweep tester • spectrum analysers • sweep test coaxial and wave guide antenna systems • standing wave ratio (SWR) meters • transmitter/receiver filter combiner equipment • video tester.

Interconnecting cables may include:	• communications cables:
	  • Category 5 or 6
	  • coaxial cable

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RANGE STATEMENT	
	• data cables • jumper cables • optical patch cords • control cables • power cables • signal cables.
Test may include:	• bit error rate (BER) • continuity • end to end • frequency response • functionality test • gain and attenuation • loop back • signal to noise ratio • speed.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4210A Implement and troubleshoot enterprise routers and switches

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to implement and troubleshoot routers and switches. It involves configuring and programming routers and switches to establish voice and data services and applications over local area networks (LAN) and wide area networks (WAN) connections for enterprise networks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to medium to large enterprises requiring the use of internetwork services and applications. It also applies to networks employing virtual LAN (VLAN) connectivity and hierarchical addressing schemes and where access control will be used to achieve network security. Relevant job roles include installer of IP networks, enterprise network technician, network administrator and network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for implementation of network routers and switches	1.1. Prepare for given work according to occupational helath and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the network routers and network switches and ***network resources*** from job briefs or appropriate personnel 1.4. Select and obtain network services and network application requirements according to ***enterprise procedures*** 1.5. Obtain identified operating instructions, manuals, hardware and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Implement network switches and routers	2.1. Configure routers and switches according to manufacturer's specifications and enterprise procedures 2.2. Determine ***network addressing scheme*** for network connectivity and verify using ***calculations*** 2.3. Activate and verify network WAN links to provide network connectivity 2.4. Enable ***network services*** and ***network applications*** to the network to complete network connectivity process 2.5. Set up traffic access and filtering according to enterprise procedures
3. Troubleshoot network switches and routers	3.1. Monitor network performance and isolate faults using diagnostic and analysis tools 3.2. Troubleshoot network and internet connectivity according to manufacturer's specifications and enterprise procedures
4. Document configuration and troubleshooting records	4.1. Restore work site to safe condition according to established safety procedures 4.2. Record and store ***essential implementation information*** according to enterprise procedures 4.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with technical staff
- literacy skills to read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data and perform calculations
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot common network problems
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to :
  - configure and activate network access and security measures
  - configure switches and routers to enable LAN and WAN links
  - connect enterprise networks using WAN services and applications
  - connect the enterprise network to external services
  - maintain enterprise network documentation
  - troubleshoot network faults and implement recovery action
  - use a hierarchical internet protocol (IP) network address scheme
  - use tools and equipment to analyse enterprise network

Required knowledge

- access control lists
- correct use of tools and equipment
- enterprise:
  - features and applications
  - OHS procedures
  - record keeping procedures
  - switching and routing protocols and strategies:

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REQUIRED SKILLS AND KNOWLEDGE
• hierarchical addressing • multilayer switching • routing protocols • VLAN routing • implement enterprise WAN links • network diagnostic and troubleshooting techniques • network modelling

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine customer networking requirements • configure routers and switches using hierarchical addressing over VLANs to meet network link requirements • enable and control access to network services and applications across the network • diagnose and rectify network hardware and device configuration faults • document configuration information, fault-finding history and remediation action.
Context of, and specific resources for assessment	Assessment must ensure: • a network facility and workstations • operating instructions, installation documents and manuals • hardware and software testing tools currently used in industry.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and troubleshooting routers and switches • review documentation of implementation and troubleshooting prepared by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2207A Install and configure a home or small office network • ICTTEN2208A Install and configure a small to medium business network

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EVIDENCE GUIDE	
	• ICTTEN2209A Build and maintain a secure network. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures

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RANGE STATEMENT	
	• material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fumes • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
Network resources may include:	• domain name system (DNS) server • dynamic host configuration protocol (DHCP) server • files • software • web browser.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Network addressing scheme may include:	• dynamic • static • subnet.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system

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RANGE STATEMENT	
	• binary subtraction.
Network services may include:	• authentication servers • collaborative services • DHCP • directory services • DNS • email • network file system • printing • web services.
Network applications may include:	• media player • spreadsheet • word-processor.
Essential implementation information may include:	• fault history • installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • network recovery actions • passwords • router configuration details • security access codes • switch configuration details.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4211A Design, install and configure an internetwork

Modification History

Not Applicable

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Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to design, install and configure an enterprise local area network (LAN) and wide area network (WAN) internetwork. It involves testing and troubleshooting an internetwork. The design involves determining network requirements and topology selection for wired and wireless infrastructure. Advanced routing and addressing schemes are also used in the design. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to the design, installation and configuration of cable and wireless networks suitable for large, medium and small office home office (SOHO) enterprises. Relevant job roles include designer and installer of IP networks, enterprise internetwork technician, network administrator and network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for the design and installation of an internetwork	1.1. Prepare for given work according to occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the ***internetwork*** from job briefs and appropriate personnel 1.4. Obtain operating instructions, manuals, hardware and software testing methodologies 1.5. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Design an enterprise internetwork	2.1. Produce enterprise ***internetwork topology*** after considering technical requirements, physical and financial constraints and expansion projections 2.2. Determine ***network devices*** and ***network resources*** according to enterprise procedures 2.3. Produce the internetwork design including network security and router and switch configurations to meet design specifications and ***enterprise procedures***
3. Install and configure a designed internetwork	3.1. Install network hardware to network topology design plan according to enterprise procedures 3.2. Determine ***network addressing scheme*** for network connectivity and verify using ***calculations*** 3.3. Configure routers and switches to perform the logical connection of the internetwork 3.4. Conduct connectivity and performance tests to verify the network installation meets the design specification 3.5. Troubleshoot internetwork and internet connectivity according to manufacturer's specifications and enterprise procedures
4. Complete and document network design and installation	4.1. Restore worksite to safe condition according to established safety procedures 4.2. Record and store ***essential design and installation information*** according to enterprise procedures 4.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise and negotiate with customers and peers to achieve design specifications
- literacy skills to:
  - develop network documentation and maintain network records
  - read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot common network problems according to help desk procedures
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - analyse the impact of applications on traffic flow in the network
  - apply network design methodologies to design networks that provide a range of services and applications found in larger networks
  - conduct a wireless site survey
  - determine customer requirements and a design specification
  - determine the impact of upgrading hardware and software on network functionality
  - identify the technical requirements, constraints and manageability issues for a given customer network requirement
  - install a network design
  - use tools and equipment

Required knowledge

- enterprise OHS procedures
- open systems interconnect (OSI) layered communication model
- network requirements:
  - applications

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REQUIRED SKILLS AND KNOWLEDGE
• lifecycle • manageability • quality of service • network design concepts: • business requirements • network topologies • physical and financial constraints • security • wired or wireless options • tool and equipment use • troubleshooting: • impact of network failure • maintenance • troubleshooting methodology

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • determine customer requirements • design an internetwork that uses advanced routing and addressing techniques • install an internetwork according to design specification • configure network devices to meet design functionality • document internetwork design, installation and configuration.
Context of, and specific resources for assessment	Assessment must ensure: • a site where design and installation of an internetwork network may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate designing, installing and configuring an internetwork • review of documents prepared by the candidate detailing design and installation • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2207A Install and configure a home or small office network • ICTTEN2208A Install and configure a small to

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EVIDENCE GUIDE	
	medium business network • ICTTEN4210A Implement and troubleshoot enterprise routers and switches. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes

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RANGE STATEMENT	
	• legislation • local safe operation procedures • material safety management systems • protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
Internetwork may refer to:	• connection of two or more distinct computer networks or network segments via a common routing technology • LAN • WAN.

Internetwork topology may refer to:	• physical and logical interconnection between network devices:
	  • bus
	  • mesh
	  • ring
	  • star
	  • tree.

Network devices may include:	• cable and wireless:
	  • router
	  • server
	  • switch.

Network resources may include:	• files • printers • software.
Enterprise procedures may	• instructions: • designs

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RANGE STATEMENT	
include:	• drawings • job sheets • plans • manufacturer's specifications • operational procedures • reporting and communication • use of tools and equipment.
Network addressing scheme may include:	• dynamic • static • subnet.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.
Essential design and installation information may include:	• configuration • design • installation • installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes • troubleshooting reports.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units	

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Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4212A Apply advanced routing protocols to network design

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to use software tools, equipment, software and protocols to configure and troubleshoot network routers. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to configuration, analysis and troubleshooting of routers in small and medium sized enterprise (SME) networks. It is relevant to advanced routing networks that employ subnet addressing and provide services over a secure network. Relevant job roles include installer of internet protocol (IP) SME networks, SME network technician, network administrator and network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan to apply routing protocols	1.1. Prepare for given work according to occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the ***network*** and ***network routing requirements*** from job briefs and appropriate personnel 1.4. Determine hardware and software diagnostic test methodologies and testing resources according to ***enterprise procedures*** 1.5. Obtain operating instructions, manuals, hardware and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Build and test advanced routing	2.1. Set up router interfaces according to manufacturer's specifications and established procedures 2.2. Implement advanced routing protocols to achieve network design requirements 2.3. Implement classless addressing across a network to perform logical connectivity and confirm using ***calculations*** 2.4. Troubleshoot network routing according to manufacturer's specifications and established procedures 2.5. Identify security threats and initiate control measures according to enterprise procedures
3. Complete and document advanced router installation	3.1. Restore worksite to safe condition according to established safety procedures 3.2. Record and store ***essential installation information*** according to enterprise procedures 3.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise and negotiate with customers and peers to achieve design specifications
- literacy skills to:
  - develop network documentation and maintain network records
  - read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot common network problems according to help desk procedures
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - configure network routing interfaces and protocols
  - implement IP addressing schemes and security strategies
  - troubleshoot advanced routing for client networks
  - use software tools and equipment
  - verify routing

Required knowledge

- distance vector routing protocols RIP v1 and v2
- dynamic routing
- enterprise OHS procedures
- hybrid routing protocols enhanced interior gateway routing protocol (EIGRP)
- link-state routing protocols open shortest path first (OSPF)
- routing and packet forwarding
- routing tables
- scalable routing strategies variable length subnet masking (VSLM) and classless inter-domain routing (CIDR)
- security protocols using access lists
- static routing
- use of software tools and equipment

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan network routing requirements to meet design specification • configure advanced protocols on network routers • manage network addressing • troubleshoot the network • install network security.
Context of, and specific resources for assessment	Assessment must ensure: • a network facility and workstations • tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate applying advance routing protocols • review documentation of network routing requirements and router installation prepared by the candidate • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2209A Build and maintain a secure network • ICTTEN4213A Configure and troubleshoot advanced network switching • ICTTEN4214A Install and maintain a wide area network.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures • material safety management systems

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RANGE STATEMENT	
	• protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
Network may include:	• internetwork • LAN • WAN.
Network routing requirements may include:	• addressing schemes • latency • management • packet loss • protocols • security.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.

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RANGE STATEMENT	
Essential installation information may include:	• configuration • installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes • troubleshooting reports.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4213A Configure and troubleshoot advanced network switching

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to perform network switch configuration and troubleshooting, including network management by remote access for wired and wireless networks. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	This unit applies to large networks involving wireless local area networks (WLANs), virtual local area networks (VLANs), interVLAN routing, remote access management and operating system management of network devices. Relevant job roles include installer of internet protocol (IP) enterprise networks, enterprise network technician, network administrator and network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare to work on a switched network	1.1. Prepare for given work according to occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the network and network topology from job briefs or appropriate personnel 1.4. Select and obtain wireless and wired network components requirements according to ***enterprise procedures*** 1.5. Obtain operating instructions, manuals, hardware and software testing methodologies 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Configure network switches	2.1. Set up and configure network switches according to manufacturer's specifications and enterprise procedures 2.2. Build and configure a routed network using remote access management 2.3. Establish multiple VLANs across the network to manage the access and traffic across the network
3. Troubleshoot network	3.1. Monitor network traffic and assess performance against manufacturer's specifications and established procedures 3.2. Troubleshoot network according to manufacturer's specifications and enterprise procedures 3.3. Identify and rectify faults according to enterprise procedures
4. Complete and document network installation and configuration	4.1. Restore worksite to safe condition according to established safety procedures 4.2. Record and store ***essential configuration information*** according to enterprise procedures 4.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with customers and peers to achieve outcomes
- literacy skills to read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot network malfunctions
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - configure a network to support multiple VLANS
  - configure a switch using VLAN trunking and spanning tree protocols
  - design and build a interVLAN switched network
  - establish LAN switching over a wireless network
  - install switch and remote access security
  - use tools and equipment

Required knowledge

- enterprise OHS procedures
- interVLAN routing
- spanning tree protocol
- switch and remote network security management
- tool and equipment correct usage
- troubleshooting procedures
- VLAN trunking protocol
- wireless LAN setup and access configuration

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • build and configure a routed network • configure a VLAN on a given network topology • configure VLAN trunking and spanning tree protocols • establish VLANs over a wireless network • design and deploy remote access and network security.
Context of, and specific resources for assessment	Assessment must ensure: • a site where configuring advanced network switching may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate performing network switch configuration • direct observation of the candidate troubleshooting network problems • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2209A Build and maintain a secure network • ICTTEN4212A Apply advanced routing protocols to network design • ICTTEN4214A Install and maintain a wide area network.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures • material safety management systems

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RANGE STATEMENT	
	• protective equipment.
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke and fugitive emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment.

Essential configuration information may include:	• installation software • installation and configuration documentation • IP addressing schemes • logical and physical diagrams • network administrator codes • passwords • security access codes • troubleshooting reports.

Unit Sector(s)

Unit sector	Telecommunications

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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ICTTEN4214A Install and maintain a wide area network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to use appropriate tools, equipment, software and protocols to install and maintain a wide area network (WAN). No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.

Application of the Unit

Application of the unit	The unit applies to the installation and maintenance of medium to large enterprise networks requiring secure WAN access. Relevant job roles include installer of internet protocol (IP) networks, IP network technician, network administrator and network support.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for the installation and maintenance of a network with WAN access	1.1. Prepare for given work according to occupational health and safety (***OHS***) and ***environmental requirements*** with ***appropriate personnel*** 1.2. Identify safety hazards and implement risk control measures in consultation with appropriate personnel 1.3. Determine nature and scope of the network from job briefs or appropriate personnel 1.4. Select and obtain network hardware, software, ***WAN protocol*** and technology requirements according to ***enterprise procedures*** 1.5. Obtain operating instructions, manuals, installation procedures, hardware and software testing methodologies and testing resources 1.6. Consult appropriate personnel to ensure the task is coordinated effectively with others involved at the worksite
2. Install and maintain a WAN accessible network	2.1. Determine ***network addressing scheme*** for network connectivity and confirm using ***calculations*** 2.2. Identify security threats and initiate control measures according to enterprise procedures 2.3. Set up and configure the network to provide WAN access according to manufacturer's specifications and enterprise procedures 2.4. Use hardware and software analysis and diagnostic methodologies to test network connectivity
3. Complete and document WAN network installation	3.1. Restore worksite to safe condition according to established safety procedures 3.2. Record and store ***essential installation information*** according to enterprise procedures 3.3. Notify appropriate personnel about the completion of the task according to enterprise procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

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REQUIRED SKILLS AND KNOWLEDGE

Required skills

- communication skills to:
  - identify customer requirements
  - liaise with customers and peers to achieve outcomes
- literacy skills to read and interpret enterprise procedures, manuals and specifications
- numeracy skills to interpret technical data
- planning and organisational skills to plan and prioritise own work
- problem solving skills to:
  - deal with unexpected situations on the basis of safety and specified work outcomes
  - troubleshoot client network problems using industry standard troubleshooting methodologies and tools
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - follow enterprise OHS procedures
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - determine and select an appropriate WAN configuration
  - facilitate network connectivity by installing and configuring a WAN communication protocols:
    - frame relay
    - high-level data link control (HDLC)
    - link access procedure, balance (LAPB)
    - point-to-point (PPP)
  - implement teleworker services and network security measures
  - use tools and equipment

Required knowledge

- enterprise OHS procedures
- IP addressing services and network scaling
- methods of securing network services including access control lists
- Open Systems Interconnection layered communication model
- requirements to provide teleworker network services
- tools and equipment correct usage
- WAN link protocols:
  - frame relay

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REQUIRED SKILLS AND KNOWLEDGE
• HDLC • LAPB • PPP • WAN troubleshooting methodologies and analysis and diagnostic tools

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • plan the installation of a WAN accessible network • select and apply WAN link protocols • configure IP addressing across the WAN • troubleshoot WAN communication issues • install WAN access security measures.
Context of, and specific resources for assessment	Assessment must ensure: • a site where installation and maintenance of a WAN may be conducted • use of tools, equipment and materials currently used in industry • relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate installing and maintaining a WAN • direct observation of the candidate troubleshooting WAN communication problems • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example with: • ICTTEN2209A Build and maintain a secure network • ICTTEN4212A Apply advanced routing protocols to network design • ICTTEN4213A Configure and troubleshoot advanced network switching.

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EVIDENCE GUIDE	
	Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
OHS may include:	• awards provisions • hazardous substances and dangerous goods codes • legislation • local safe operation procedures • material safety management systems • protective equipment.

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RANGE STATEMENT	
Environmental requirements may include:	• dust • excessive energy and water use • excessive noise • fume • gas • liquid waste • smoke emissions • solid waste • vapour.
Appropriate personnel may include:	• customer • manager • network manager • site engineer • supervisor.
WAN protocol may include:	• frame relay • HDLC • LAPB • PPP.

Enterprise procedures may include:	• instructions:
	  • designs
	  • drawings
	  • job sheets
	  • plans
	• manufacturer's specifications
	• operational procedures
	• reporting and communication
	• use of tools and equipment:
	  • bit error rate tester (BERT)
	  • protocol analyser
	  • WAN analyser.

Network addressing scheme may include:	• dynamic addressing • static addressing • subnet addressing.
Calculations may include:	• binary addition • binary conversion • binary division • binary multiplication • binary number system • binary subtraction.

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RANGE STATEMENT	
Essential installation information may include:	• installation and configuration documentation • installation software • IP addressing schemes • logical and physical diagrams • network administrator codes • network schematics • passwords • security access codes • troubleshooting reports.

Unit Sector(s)

Unit sector	Telecommunications

Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering

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MEM05007C Perform manual heating and thermal cutting

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers performing manual heating, thermal cutting and gouging including the assembly and disassembly and operation of the equipment on a range of materials (ferrous, non-ferrous and non-metallic) using a variety of methods.

Application of the Unit

Application of the unit	This unit applies to manual, straight line cutting standards. Manual or automatic processes are used to cut and heat to specifications. Cutting may include flame gouging by hand. All work is carried out to legislative and regulatory requirements. Predetermined standards of quality and safety are observed and work is carried out following standard operating procedures. **Band**: **A** **Unit Weight**: **2**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

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Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Assemble/disassemble plant and equipment	1.1. Accessories and equipment are correctly selected and assembled for manual heating and thermal cutting.
2. Operate heating and thermal cutting equipment	2.1. Cutting process and/or procedure appropriate for material is selected. 2.2. All safety procedures are observed. 2.3. Equipment start-up procedures are followed correctly to standard operating procedures. 2.4. Equipment adjustments are made correctly using standard operating procedures. 2.5. Appropriate cutting allowances are made. 2.6. Material is used in the most economical way. 2.7. Defects are identified and corrective action is taken to standard operating procedures. 2.8. Material is heated and cut to specification. 2.9. Shape/size/length is to accepted workplace standards.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- performing pre-start checks
- safely starting equipment
- following standard operating procedures
- adjusting equipment to operating specifications
- making cutting allowances
- economising material and minimising wastage
- identifying cutting defects and taking corrective action
- heating and cutting materials to specifications
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings

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REQUIRED SKILLS AND KNOWLEDGE
• following oral instructions • performing measurements needed to meet the requirements of this unit • entering routine and familiar information onto proformas and standard workplace forms
Required knowledge
Look for evidence that confirms knowledge of: • cutting processes appropriate to various materials • heating and cutting specifications • procedures for heating and cutting • the tools, equipment and techniques for heating and cutting • assembling procedures for equipment and accessories • hazards and control measures associated with manual heating and thermal cutting • use and application of personal protective clothing and equipment • equipment pre-checks and operation • procedures for adjusting heating and cutting equipment • cutting allowances and reasons for applying them • procedures for minimising waste material • reasons for minimising waste material • cutting defects and their causes • procedures for correcting cutting defects • tools, equipment and techniques required to correct cutting defects • use and application of personal protective equipment • safe work practices and procedures

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to perform manual heating and thermal cutting.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with manual heating/thermal cutting or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questions should not require language, literacy and numeracy skills beyond those required in this unit. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

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Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Cutting	Use of hand held and self-propelled straight line cutters
Process	Fuel gas, oxy fuel gas and air fuel gas
Material	Various thicknesses and types including ferrous, non-ferrous and non-metallic materials

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Fabrication

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MEM05012C Perform routine manual metal arc welding

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers preparing the materials and carrying out routine manual metal arc welding (MMAW).

Application of the Unit

Application of the unit	This unit applies in a maintenance or manufacturing environment where the welding is not required to meet an Australian standard or equivalent. Fillet and butt welds would typically be performed on low carbon/mild steels. Where welding is required to AS 1554 General Purpose or equivalent codes, occupational health and safety regulations and/or licensing requirements, Unit MEM05015D (Weld using manual metal arc welding process) should be selected. **Band**: **A** **Unit Weight**: **2**

Licensing/Regulatory Information

Refer to Application of the Unit

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify weld requirements	1.1. Weld requirements are identified from job instructions. 1.2. Location of welds is identified in accordance with standard operating procedures and job specifications.
2. Prepare materials for welding	2.1. Materials are cleaned and prepared ready for welding.
3. Prepare equipment for welding	3.1. Welding equipment is set up correctly. 3.2. Correct electrodes are selected to suit application and settings.
4. Perform routine welding using MMAW	4.1. Safe welding practices are applied. 4.2. Materials are welded to job requirements. 4.3. Welds are cleaned in accordance with standard operating procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- preparing materials and electrodes
- setting up welding equipment
- welding with MMAW
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures
- performing measurements for joint preparation and routine MMAW

Required knowledge

Look for evidence that confirms knowledge of:

- material and equipment preparation
- properties and characteristics of materials and consumables
- weld characteristics
- equipment set-up and settings
- MMAW processes and properties

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REQUIRED SKILLS AND KNOWLEDGE
• post-welding treatments • safe welding practices • use and application of personal protective equipment

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to prepare materials and carry out routine manual metal arc welding (MMAW).
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, i.e. the candidate is not in productive work, then appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing routine manual metal arc welding or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning should not require language, literacy and numeracy skills beyond those required in this unit. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for	

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EVIDENCE GUIDE	
assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Materials	Low and mild carbon steel or similar
Prepared	Cleaning, setting up jigs, fixtures, clamps, joint preparation
Welding equipment	Welding leads, welding machines, electrode holder etc.
Cleaned	Slag and spatter, cleaning, using files and grinders

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Fabrication

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MEM16006A Organise and communicate information

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers accessing, organising and communicating information related to processes or tasks.

Application of the Unit

Application of the unit	This unit applies in manufacturing, engineering or related environments. It may include information related to production, maintenance or associated processes. Information may be drawn from a variety of sources. This unit includes the ability to communicate using common workplace terminology. For access and recording of data requiring system knowledge and judgement, see Unit MEM16008A (Interact with computing technology). **Band**: **A** **Unit Weight**: **2**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units	

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Prerequisite units	

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Access information and/or records	1.1. Information requirements of tasks are determined and relevant information is accessed from a range of sources. 1.2. Workplace terminology is correctly recognised.
2. Organise and analyse information	2.1. Information is interpreted and organised in accordance with enterprise and work requirements. 2.2. Information is analysed according to enterprise and work requirements.
3. Communicate organised information using established workplace methods	3.1. Information is communicated using established workplace methods.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- accessing relevant information from a range of sources
- recording, where appropriate, the accessed information
- recognising and using workplace terms
- reading, interpreting and following information in workplace documentation
- checking and clarifying information
- organising, categorising and sequencing information

Required knowledge

Look for evidence that confirms knowledge of:

- types of information
- available sources of information
- information analysis techniques
- methods of categorising and organising information
- methods of recording and communicating information

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to organise, analyse and communicate information.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with organising, analysing and communicating information or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for	

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EVIDENCE GUIDE	
assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Range of sources	Job instructions, specifications, standard operating procedures, charts, lists, documents, computer data, drawings, sketches, tables, technical manuals and/or charts and other applicable reference material
Workplace terminology	Terminology - referring to equipment, processes, workplace areas, staff and procedures - specific to the processes and equipment used in the workplace
Analyse	Analysis for this unit involves simple determinations of relevance and implication for the employee's immediate work requirements
Established workplace methods	• Proforma reports • Data entry e.g. bar coding and simple keyboard operations • Verbal • Drawings

Unit Sector(s)

Unit sector	

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Communication

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MEM16008A Interact with computing technology

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers accessing, inputting and storing information used in manufacturing, engineering or related environments, using computing technology.

Application of the Unit

Application of the unit	This unit applies in manufacturing, engineering or related environments. It involves identifying the type and source of information required, and using the technology to access, input and store information. The equipment may include computers and a range of other equipment based on computing technology. **Band**: **A** **Unit Weight**: **2**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units	

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Determine job requirements	1.1. Nature and scope of task requirement are identified. 1.2. Information/data required to be accessed, input or stored is identified. 1.3. Source of information/data is identified.
2. Access information/data	2.1. Access procedures are followed. 2.2. Technology is navigated to find the required information/data. 2.3. Relevant software application menus, functions and commands are used to locate required information/data. 2.4. Information/data is retrieved using organisational procedures. 2.5. Information/data is checked for relevance to job requirements.
3. Input information/data	3.1. Relevant software menus, functions and commands are used to manipulate information/data. 3.2. Information/data is entered, changed, or removed as required.
4. Store information/data	4.1. Data/files are saved following standard procedures prior to exiting the application. 4.2. Data output is produced as required. 4.3. Procedures for shutting down/logging off/exiting computing technology are followed.
5. Access assistance as required	5.1. Appropriate personnel are identified and consulted as required. 5.2. Manuals, online help and other reference materials are identified and used as required.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in:

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REQUIRED SKILLS AND KNOWLEDGE
• ability to enter or retrieve data using appropriate software applications • reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents • planning and sequencing operations • checking and clarifying task-related information • using numerical operations within the scope of this unit
Required knowledge
Look for evidence that confirms knowledge of: • functions and capabilities of various types of computing technology used in the workplace • functions of software applications • hazards and control measures associated with using computing technology, including housekeeping • safe work practices and procedures

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to interact with computing technology to achieve workplace outcomes.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with interacting with computing technology or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning should not require language, literacy and numeracy skills beyond those required in this unit. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for	

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EVIDENCE GUIDE	
assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Access procedures	Logging on and security procedures, virus checks, start-up routines, application start-up
Technology	Hand held data recording devices, screen based equipment, personal computers, bar coders
Applications	• Word processing spreadsheets and databases • Customised engineering and manufacturing applications • Material Resource Planning (MRP) • Warehousing inventory applications • Predictive reliability and maintenance applications • Production data management applications
Data output	Report, email, chart, graph, printout, data transfer, labels

Unit Sector(s)

Unit sector	

Co-requisite units

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Co-requisite units		

Competency field

Competency field	Communication

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MEM30001A Use computer aided drafting systems to produce basic engineering drawings

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers producing basic engineering drawings using a CAD system, under the direction of a supervisor.

Application of the Unit

Application of the unit	This unit applies to the production of drawings according to defined parameters and predetermined specifications that include materials, tolerances, codes and other specifications. All work is conducted under supervision. Standard CAD software would be used including inbuilt file management, macros and reports. Drawings include plans, diagrams, charts, circuits, systems or schematics. If basic engineering drawings are required, then Unit MEM30002A (Produce basic engineering graphics) should be selected. If detailed engineering drawings are required, then Unit MEM30003A (Produce detailed engineering drawings) should be selected. **Band**: **0** **Unit Weight**: **0**

Licensing/Regulatory Information

Not Applicable

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Pre-Requisites

Prerequisite units		
Path 1	MEM16006A	Organise and communicate information
	MEM16008A	Interact with computing technology

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare the CAD environment	1.1. All relevant manuals, instructions and operating procedures for the CAD software are obtained in accordance with workplace procedures. 1.2. The CAD package is booted up in accordance with workplace procedures. 1.3. Screen display areas and basic parameters are set in accordance with instructions.
2. Produce a basic drawing	2.1. Basic CAD drawings are created and guidance is sought as required. 2.2. Drawings are prepared in accordance with AS 1100 or equivalent or in accordance with standard operating procedures. 2.3. As required, CAD drawings are reviewed with supervisor and/or other designated staff in accordance with company procedures.
3. Modify existing CAD drawings	3.1. Existing CAD drawings are located and modified by adding, deleting or changing drawing elements within that drawing.
4. Produce output	4.1. Drawing files are saved in the appropriate format in accordance with standard operating procedures. 4.2. Drawing files are printed out using plotter or equivalent devices.
5. Perform exit and shut-down procedures	5.1. Programs and computer are shut down in accordance with workplace procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • reading and interpreting engineering specifications • organising information • using computer and peripherals

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REQUIRED SKILLS AND KNOWLEDGE
• using CAD program • preparing simple drawings in plane orthogonal, isometric projection or equivalent
Required knowledge
Look for evidence that confirms knowledge of: • CAD program capabilities and processes

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to use computer aided drafting systems to produce basic engineering drawings. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with producing basic engineering drawings using computer aided drafting systems, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes,

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EVIDENCE GUIDE	
	standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Basic parameters	Include layer or level, line type, line width, colour and text format etc.
Basic CAD drawings	Include the following characteristics: lines, arcs, circles, polygons, ellipses, hatching or filling of areas, text, dimensions and tangents
Equivalent devices	May include ink jet printers or the like

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Engineering technician

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MEM30002A Produce basic engineering graphics

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers producing drawings or similar graphical representations where the critical dimensions and associated tolerances and design specifications are predetermined.

Application of the Unit

Application of the unit	This unit applies to any of the full range of engineering disciplines. All work is carried out under supervision. Manual drafting or CAD drawing equipment may be used. If CAD skills are required, then Unit MEM30001A (Use computer aided drafting systems to produce basic engineering drawings) and its prerequisites should be selected If additional CAD skills are required, then Unit MEM30004A (Use CAD to create and display 3D models) should also be selected. If fully detailed drawings are required, then Unit MEM30003A (Produce detailed engineering drawings) should be selected. **Band**: **0** **Unit Weight**: **0**

Licensing/Regulatory Information

Not Applicable

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Pre-Requisites

Prerequisite units		
Path 1	MEM16006A	Organise and communicate information
	MEM16008A	Interact with computing technology

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify drawing requirements	1.1. All relevant job requirements and design specifications are obtained in accordance with workplace procedures. 1.2. Drawing requirements and specifications are identified and interpreted.
2. Prepare assembly, layout and general drawings in accordance with instructions	2.1. Drawings are prepared in plane orthogonal, isometric projection or equivalent. 2.2. Problems are resolved in consultation with a supervisor.
3. Draw sections through simple engineering components as required for clarity	3.1. Sections are drawn through an engineering component incorporating correct use of cutting plane(s) symbols and conventions.
4. Select physical dimensions from manufacturer handbooks	4.1. Where required, components and/or materials are selected from supplier/manufacturer catalogues using predetermined design specifications.
5. Prepare engineering parts list	5.1. An engineering parts list is produced in accordance with workplace procedures.
6. Issue or file completed drawing/parts list	6.1. Approved drawings and/or parts lists are stored, catalogued and issued in accordance with standard operating procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • correctly using and maintaining equipment including CAD • manual drafting, filing and printing • reading and interpreting specifications • communicating

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REQUIRED SKILLS AND KNOWLEDGE
• visualising components • preparing a drawing in plane orthogonal, isometric projection or equivalent
Required knowledge
Look for evidence that confirms knowledge of: • drafting media including cartridge paper, tracing paper, drafting film, plan printing paper • layout conventions • effective use of blank space, location of notes and symbols • sectioning • draw sections through an engineering component incorporating correct use of cutting plane(s) symbols and conventions. • overview of graphical techniques • assembly drawings, explosion drawings • schematics/line drawings, graphs, pictorials

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to produce basic engineering graphics. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with producing basic engineering graphics, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

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EVIDENCE GUIDE	
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Specifications	May be obtained form design information, customer, ideas, concepts/expectations/requirements, sketches, preliminary layouts
Drawings	Include plans, diagrams, charts
Consultation	May include reference to appropriate personnel including technical supervisors, manufacturers, suppliers, contractors, customers
Engineering parts list	May include part name, description of part, material specification or part number, quantities and other details as required
Issued drawings	Hard copy, photographic, slide or transparency form including presentation as a single drawing and/or with other drawings, support documentation as a package

Unit Sector(s)

Unit sector	

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Co-requisite units

Co-requisite units		

Competency field

Competency field	Engineering technician

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MEM30003A Produce detailed engineering drawings

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers producing detailed drawings of engineering components complete with surface texture details and dimensions.

Application of the Unit

Application of the unit	This unit applies to all engineering and manufacturing environments. Work is carried out under supervision. Drawings may be produced with or without the use of computer aided design (CAD) systems. **Band**: **0** **Unit Weight**: **0**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM16006A	Organise and communicate information
	MEM16008A	Interact with computing technology

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Prerequisite units		
	MEM30001A	Use computer aided drafting systems to produce basic engineering drawings
	MEM30002A	Produce basic engineering graphics

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Determine drawing requirements	1.1. Drawing requirements are checked and interpreted from work order or similar. 1.2. Required information is sourced from workshop manuals, customer specifications, product suppliers, designers or similar. 1.3. Scope of drawing including layout, additional required information and resources is planned.
2. Produce detail drawings in third angle projection, including auxiliary views, sections and assemblies	2.1. Drawing details including assembly and components are completed as per AS 1100 or similar. 2.2. Dimensions of various components are determined and inserted where required. 2.3. Appropriate symbols for limits and fits, surface texture and geometric tolerances are included. 2.4. Simple components or layouts are drawn in third angle projection. 2.5. An auxiliary view is drawn of a component, given two views. 2.6. Correct convention for parts is shown.
3. Issue and/or file drawing	3.1. Drawing is issued and/or filed according to workplace procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • drawing • documenting • applying principles of geometric tolerances • identifying functional surfaces and datums on assembly drawings • producing detail drawings of machine components and dimension from datums
Required knowledge

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REQUIRED SKILLS AND KNOWLEDGE
Look for evidence that confirms knowledge of: • projection • auxiliary views, special attention • detail drawing methods • standard engineering drawing symbols, references and terminology • projection lines • arrangements • general tolerancing • limits and fits • shaft and hole basis • extremes of fit • surface texture • selection of standard roughness values for given processes • application of surface finish symbols to drawings • selection and application of equivalent surface roughness numbers • geometric tolerancing • simple geometry tolerancing (no datum references, flatness, roundness etc.) • geometry tolerance with datum reference (e.g. parallel squareness)

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to produce detailed engineering drawings. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, i.e. the candidate is not in productive work, an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with producing detailed engineering drawings, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

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EVIDENCE GUIDE	
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Geometric tolerances	• Simple geometry tolerancing (no datum references, flatness, roundness etc.) • Geometry tolerance with datum reference (e.g. parallel squareness)
Simple components or layouts	May include fabricated components, machined components, cast and forged components, structural details, electrical electronic components, fluid power components
Parts	• Mechanical components such as fasteners, bearings, seals, gears, keys, splines etc. • Electrical components such as cables, connectors, terminations etc. • Fluid power components such as actuators, valves, hoses, connectors, relays etc.

Unit Sector(s)

Unit sector	

Co-requisite units

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Co-requisite units		

Competency field

Competency field	Engineering technician

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MEM30004A Use CAD to create and display 3D models

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers using a CAD program to produce and plot basic three dimensional view drawings.

Application of the Unit

Application of the unit	This unit applies to the production of three dimensional models using computer aided design and drawing software and associated equipment. This will include the use of region and solid modelling techniques, section views, and pre-drawn library files. Work also includes extraction of properties and application of basic rendering techniques. All work is conducted under supervision. **Band**: **0** **Unit Weight**: **0**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM16006A	Organise and communicate information
	MEM16008A	Interact with computing technology

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Prerequisite units		
	MEM30001A	Use computer aided drafting systems to produce basic engineering drawings

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Set up a three dimensional environment	1.1. Set up a three dimensional environment on the screen to allow multiple viewing.
2. Create three dimensional views	2.1. Three dimensional views are created on the screen by manipulation of drawing planes and insertion of three dimensional geometric shapes. 2.2. Any plane of the three dimensional view is drawn on. 2.3. Editing functions are used to modify three dimensional geometric shapes in creating three dimensional views.
3. Display three dimensional views	3.1. Wire line, surface and solid face displays are produced in isometric, perspective and orthographic projections.
4. Extract mass and area properties of a 3D model	4.1. The mass and surface area of a given solid model made from a nominated material is extracted.
5. Apply basic rendering techniques to a 3D model	5.1. A solid model is rendered to a specified set of criteria.
6. Save completed drawing file in various formats	6.1. File is saved in an appropriate format to enable retrieval and use in a CAD system. 6.2. File is saved in other formats to enable retrieval in other software applications.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • reading and interpreting engineering specifications • organising information • using computer and peripherals

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REQUIRED SKILLS AND KNOWLEDGE
• using CAD program • saving 3D modes in various file formats • preparing drawings in plane orthogonal, isometric projection or equivalent
Required knowledge
Look for evidence that confirms knowledge of: • region modelling techniques. • solid modelling techniques • development of sectioned models • use of cutting plane • use of cross hatching • use of pre-drawn library files and primitives to produce a 3D model • use of third level software to produce 3D models • how to extract mass and area properties • how to extract area properties from region models • application of basic rendering techniques to a 3D model

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Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to use CAD to create and display 3D models. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with using CAD to create and display 3D models or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

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EVIDENCE GUIDE	
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Multiple viewing	Includes top views, front and side views, and a general three dimensional view
Three dimensional geometric shapes	May include arcs and lines, spheres, cones, cylinders and boxes

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

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Competency field

Competency field	Engineering technician

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MSS402001A Apply competitive systems and practices

Modification History

New unit, superceding MSACMS200A Apply competitive manufacturing practices - Equivalent

Unit Descriptor

This unit of competency covers the skills and knowledge required to implement basic improvement practices within an organisation using competitive systems and practices. The unit focuses on bringing together the basic concepts and the holistic application of these basic concepts and processes to operations. It would typically be carried out working as part of a team.

Application of the Unit

This unit applies to an individual in an organisation that has embarked on competitive systems and practices. The unit covers the skills and knowledge required to contribute to the competitive systems and practices processes and assumes that they are to be used within the scope of the individual's job and authority.
This unit requires the application of skills associated with planning and organising an individual's own role within the competitive systems and practices framework.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Identify own place in the value chain	1.1	Identify customers relevant to own work and their needs/requirements
		1.2	Identify suppliers for own work
		1.3	Identify value contributions along the chain
		1.4	Identify and recommend methods of increasing own contribution to the value chain
2	Improve the product and process value	2.1	Identify customer features/benefits in the product and process
		2.2	Identify aspects of product and process which contribute to customer features/benefits
		2.3	Identify aspects of product and process which do not contribute to customer benefits/features
		2.4	Recommend methods of reducing waste and increasing features/benefits
3	Use competitive systems and practices	3.1	Identify competitive systems and practices used in organisation and own work area
		3.2	Apply practices appropriate for the job or process
		3.3	Monitor the job/process and make adjustments to improve it in accordance with procedures
		3.4	Identify own skill requirements and seek skill development, if required

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- communicating with others to clarify scope of competitive systems and practices implementation and contributing suggestions for improvement
- visualising normal operational procedures in terms of flow and contribution to customer outcomes
- planning own tasks to support competitive systems and practices implementation
- implementing competitive systems and practices in own work area according to instructions
- identifying waste (muda)

Required knowledge

Required knowledge includes:

- internal and external customers and the value they derive from operations
- suppliers, their capabilities and contribution to value (this may be obtained from an existing value stream map or other enterprise documentation)
- waste (muda)
- relevant competitive systems and practices for own job and how to apply them
- factors impacting on product, operations and waste, particularly those wholly or partially under their control (and how to control them)

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	A person being assessed against this unit will work effectively in a competitive systems and practices environment, making continual positive contributions to the improvement of the business within the scope of their job.
Critical aspects for assessment and	A person who demonstrates competency in this unit must

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evidence required to demonstrate competency in this unit	be able to provide evidence of the ability to: • identify the scope of competitive systems and practices implemented in their work area • identify services and/or functions supplied by suppliers and to customers • identify own tasks and responsibilities and relate them to organisation and customer requirements • identify aspects of products and process which add to or detract from customer benefit • contribute suggestions for improvement.
Context of and specific resources for assessment	Assessment of performance must be undertaken in a workplace using or implementing one or more competitive systems and practices. Access may be required to: • workplace procedures and plans relevant to work area • specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and procedures relevant to the assessee • documentation and information in relation to production, waste, overheads, and hazard control/management • reports from supervisors/managers • case studies and scenarios to assess responses to contingencies.
Method of assessment	A holistic approach should be taken to the assessment. Competence in this unit may be assessed by using a combination of the following to generate evidence: • demonstration in the workplace • workplace projects • suitable simulation • case studies/scenarios (particularly for assessment of contingencies, improvement scenarios, and so on • targeted questioning • reports from supervisors, peers and colleagues (third-party reports) • portfolio of evidence. In all cases it is expected that practical assessment will be combined with targeted questioning to assess underpinning knowledge. Where applicable, reasonable adjustment must be made to work environments and training situations to

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	accommodate ethnicity, age, gender, demographics and disability.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the candidate and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Competitive systems and practices	Competitive systems and practices may include, but are not limited to: • lean operations • agile operations • preventative and predictive maintenance approaches • monitoring and data gathering systems, such as Systems Control And Data Acquisition (SCADA) software, Enterprise Resource Planning (ERP) systems, Materials Resource Planning (MRP) and proprietary systems • statistical process control systems, including six sigma and three sigma • Just in Time (JIT), kanban and other pull-related operations control systems • supply, value, and demand chain monitoring and analysis • 5S • continuous improvement (kaizen) • breakthrough improvement (kaizen blitz) • cause/effect diagrams • overall equipment effectiveness (OEE) • takt time • process mapping • problem solving • run charts • standard procedures

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	• current reality tree Competitive systems and practices should be interpreted so as to take into account: • the stage of implementation of competitive systems and practices • the size of the enterprise • the work organisation, culture, regulatory environment and the industry sector
Customers	Customers may include: • internal or external customers and should be sufficiently close to the individual's work as to be easily identifiable • final customers used as the basis for the identification of value and waste The individual does not need to interface directly with the external customer, but should be provided with sufficient information to enable them to identify customer benefits and customer features
Suppliers	Suppliers may be: • internal or external suppliers and should be sufficiently close to the individual's work as to be easily identifiable The operator does not need to interface directly with external suppliers, but should be provided with sufficient information to enable them to identify supplier contribution to their own work and to customer benefit
Procedures	Procedures may include: • work instructions • standard operating procedures • formulas/recipes • batch sheets • temporary instructions and similar instructions provided for the smooth running of the organisation • good operating practice as may be defined by industry codes of practice (e.g. good manufacturing practice (GMP) and responsible care) and government regulations Procedures may be: • written, verbal, computer-based or in some other format

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Unit Sector(s)

Unit sector	Competitive systems and practices

Custom Content Section

Not applicable.

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MSS402020A Apply quick changeover procedures

Modification History

New unit, superseding MSACMT220A Apply quick changeover procedures - Equivalent

Unit Descriptor

This unit of competency covers the skills and knowledge required to apply quick changeover procedures in an organisation implementing competitive systems and practices.

Application of the Unit

This unit applies to individuals in an organisation which is implementing competitive systems and practices and is pursuing quick changeover as one of its competitive operations tools. The unit can apply to quick changeovers of equipment, processes, batches or product type.
This unit covers the carrying out of these quick changeovers and also recommending improvements within the scope and authority of the individual's job.
Particular technical skills may also be required in some operations sectors and for some jobs. These skills should be gained from the Training Package relevant to the individual's industry and occupation.
This unit requires the application of skills associated with applying quick changeover procedures, including the planning and organising of own work, identifying problems and making suggestions for improvement of procedures.
This unit may not be applicable to a totally continuous operation producing only the one product, or simultaneous range of products. The unit is also not applicable to a maintenance/PVI shutdown as experienced by the continuous process manufacturers. However, where there is continuous operation on a campaign basis, it may be applied to the changeover between campaigns or similar changeovers.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Prepare for changeover	1.1	Determine when changeover will be required
		1.2	Review plans and instructions for quick changeover
		1.3	Identify role of others in quick changeover
		1.4	Obtain all required tools/parts/materials for changeover
		1.5	Organise process and tools/parts/materials ready for changeover
2	Make quick changeover	2.1	Plan changeover according to quick changeover principles
		2.2	Liaise and work with relevant people in quick changeover
		2.3	Complete changeover according to procedures
		2.4	Check output meets specification
		2.5	Debrief with all relevant stakeholders
		2.6	Note any steps which cause a problem
		2.7	Recommend changes to problematic steps
3	Improve occupational health and safety (OHS)	3.1	Identify hazards to self or others in all steps/actions
		3.2	Determine risks from each hazard
		3.3	Identify actions which may be performed in a more ergonomic manner

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3.4 Recommend changes to improve OHS

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- determining/predicting when a changeover will occur through knowledge of products and processes in own work area
- communicating with others to clarify scope and procedures for quick changeover and contributing suggestions for improvement
- planning own tasks in quick changeover
- identifying and working to target changeover time
- working as part of a team
- setting up quick changeover using appropriate tools, process skills and procedures
- following OHS procedures and regulatory requirements and notifying risks

Required knowledge

Required knowledge includes:

- principles of quick changeover, including:
  - setting of target time for changeover
  - conversion of internal set-up time to external set-up time, where appropriate
  - simplification of changeover steps
  - monitoring and continuous improvement of changeovers
- relevant operational procedures
- target time for changeover
- relevant OHS regulations and requirements
- purposes/requirements of changeover
- methods of recommending changes
- quality requirements for products and processes
- minimisation of changeover waste (e.g. scrap and energy)

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment

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Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to: • identify the scope and equipment to be used in a quick changeover implemented in their work area • identify the target time • understand the difference between internal and external changeover steps • identify own tasks and responsibilities in a quick changeover • identify problems in quick changeovers • contribute suggestions for improvement.
Context of and specific resources for assessment	Assessment of performance must be undertaken in a workplace using or implementing one or more competitive systems and practices. Access may be required to: • workplace procedures and plans relevant to work area • specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and procedures relevant to the assessee • documentation and information in relation to production, waste, overheads and hazard control/management • reports from supervisors/managers • case studies and scenarios to assess response to contingencies.
Method of assessment	A holistic approach should be taken to the assessment. Competence in this unit may be assessed by using a combination of the following to generate evidence: • demonstration in the workplace • workplace projects • suitable simulation • case studies/scenarios (particularly for assessment of contingencies, improvement scenarios, and so on) • targeted questioning • reports from supervisors, peers and colleagues (third-party reports) • portfolio of evidence. In all cases it is expected that practical assessment will be combined with targeted questioning to assess

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	underpinning knowledge. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the candidate and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Competitive systems and practices	Competitive systems and practices may include, but are not limited to: • lean operations • agile operations • preventative and predictive maintenance approaches • monitoring and data gathering systems, such as Systems Control and Data Acquisition (SCADA) software, Enterprise Resource Planning (ERP) systems, Materials Resource Planning (MRP) and proprietary systems • statistical process control systems, including six sigma and three sigma • Just in Time (JIT), kanban and other pull-related operations control systems • supply, value, and demand chain monitoring and analysis • 5S • continuous improvement (kaizen) • breakthrough improvement (kaizen blitz) • cause/effect diagrams • overall equipment effectiveness (OEE) • takt time • process mapping

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	• problem solving • run charts • standard procedures • current reality tree Competitive systems and practices should be interpreted so as to take into account: • the stage of implementation of competitive systems and practices • the size of the enterprise • the work organisation, culture, regulatory environment and the industry sector
Changeover	Changeover may refer to: • an exchange of equipment (often dies or tools (traditional)) • a change between products/batches or between campaigns or processes. It may be any quantum change to produce a different product or undertake a different process In competitive systems and practices equipment-based quick changeover techniques in manufacturing can often be referred to under different names, for example: • single minute exchange of die (SMED) – The term originated with die changeovers but now often refers to the ability to perform any set-up activity in a minute or less of machine or process downtime • single-digit set-up – performing a set-up activity in a single-digit number of minutes (i.e. fewer than ten) • one touch exchange of die (OTED) – literally, changing a die with one physical motion, such as pushing a button; broadly, an extremely simple procedure for performing a set-up activity
Set-up	Set-up can be divided into two types: • internal set-up (work that can be done only when the machine or process is not actively engaged in production) • external set-up (work that can be done concurrently with the machine or process performing production duties) The same distinction can be applied to non-production equipment-based work areas where changeovers of processes or operations can be: • internal (requires work to stop, be reset, computers

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	restarted, and so on) • external (where work can continue during the changeover)
Set-up time	Set-up time includes: • the work time required to change over a machine or process from one item or operation to the next item or operation
Procedures	Procedures may include: • work instructions • standard operating procedures • formulas/recipes • batch sheets • temporary instructions and similar instructions provided for the smooth running of operations, processes, plant and equipment • good operating practice as may be defined by industry codes of practice (e.g. good manufacturing practice (GMP) and responsible care) and government regulations Procedures may be: • written, verbal, computer-based or in some other format

Unit Sector(s)

Unit sector Competitive systems and practices

Custom Content Section

Not applicable.

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MSS402021A Apply Just in Time procedures

Modification History

New unit, superseding MSACMT221A Apply Just in Time (JIT) procedures - Equivalent

Unit Descriptor

This unit of competency covers the skills and knowledge required to work in an organisation implementing Just in Time (JIT) procedures.

Application of the Unit

This unit applies to an individual working in an organisation following JIT who will need to follow procedures which are specific to JIT, such as the controlled flow of material (e.g. the use of kanban and elimination of waste). This will involve the individual in the application of the pull system to their job and the authorisation of product/material flows in accordance with procedures and their level of authority.
This unit requires the application of skills associated with planning and organising and self-management to deliver product on demand using necessary tools, equipment and processes to meet production requirements. The unit also requires an ability to recognise and act on problems that may interfere with meeting production demands.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Respond to indicator of demand	1.1	Identify pull of product through work role
		1.2	Recognise indicator of flow authorisation
		1.3	Identify production or service required
2	Make products or deliver service to demand	2.1	Make product or deliver service as required by ticket
		2.2	Identify any factors likely to prevent demand being satisfied in own work or work of the team
		2.3	Take action in accordance with procedures
3	Update demand information as required	3.1	Record information on ticket to procedures, as required
		3.2	Facilitate operation of flow authorisation as part of work
4	Recommend improvements	4.1	Examine the operation of the JIT system as it relates to own work
		4.2	Identify areas for improvement
		4.3	Identify any additional personal skill requirements to implement JIT procedures
		4.4	Recommend improvements

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- receiving ticket, kanban, order or other indicator of demand and interpreting correctly for own work function, including quantity, quality, time and delivery requirements
- ensuring that all production and movement of parts/material or delivery of a service for which the individual is responsible for takes place only as required by a downstream operation
- recognising and taking appropriate action on faults and other issues that may threaten the JIT delivery of own product or service
- reading and recording information on tickets or other indicators of demand
- suggest improvements to JIT system, as appropriate
- performing technical functions to meet indicators of demand from downstream and to issue indicators of demand upstream

Required knowledge

Required knowledge includes:

- relevant indicator of demands for own job
- own role in flow authorisation
- JIT methods relevant to job
- procedures for recommending improvements

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to: • identify the indicators of demand and the flow authorisation system in their work area • relate products and services supplied by suppliers and

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	customers to the flow authorisation system • identify own tasks and responsibilities and relate them to the flow authorisation system • interpret received indicators of demand correctly for quantity, quality and time of delivery • contribute suggestions for improvement.
Context of and specific resources for assessment	Assessment of performance must be undertaken in a workplace using or implementing one or more competitive systems and practices. Access may be required to: • workplace procedures and plans relevant to work area • specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and procedures relevant to the assessee • documentation and information in relation to production, waste, overheads and hazard control/management • reports from supervisors/managers • case studies and scenarios to assess response to contingencies.
Method of assessment	A holistic approach should be taken to the assessment. Competence in this unit may be assessed by using some combination of the following to generate evidence: • demonstration in the workplace • workplace projects • suitable simulation • case studies/scenarios (particularly for assessment of contingencies, improvement scenarios, and so on) • targeted questioning • reports from supervisors, peers and colleagues (third-party reports) • portfolio of evidence. In all cases it is expected that practical assessment will be combined with targeted questioning to assess underpinning knowledge. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
Guidance information for assessment	Assessment processes and techniques must be culturally

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	appropriate and appropriate to the oracy, language and literacy capacity of the candidate and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Competitive systems and practices	Competitive systems and practices may include, but are not limited to: • lean operations • agile operations • preventative and predictive maintenance approaches • monitoring and data gathering systems, such as Systems Control and Data Acquisition (SCADA) software, Enterprise Resource Planning (ERP) systems, Materials Resource Planning (MRP) and proprietary systems • statistical process control systems, including six sigma and three sigma • JIT, kanban and other pull-related operations control systems • supply, value, and demand chain monitoring and analysis • 5S • continuous improvement (kaizen) • breakthrough improvement (kaizen blitz) • cause/effect diagrams • overall equipment effectiveness (OEE) • takt time • process mapping • problem solving • run charts • standard procedures • current reality tree Competitive systems and practices should be interpreted so as to take into account:

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	• the stage of implementation of competitive systems and practices • the size of the enterprise • the work organisation, culture, regulatory environment and the industry sector
JIT	JIT is a scheduling concept that calls for any item or service needed for an operation, whether a service, raw material, finished item, or anything in between to be available: • precisely when the service, product or operation is to be produced or undertaken • in the right quantity and at the right quality
Product	Product may include: • a physical product • a supporting utility service, such as water, gas, power • some other service (e.g. cranes and forklifts)
Flow authorisation	Flow authorisation refers to: • a system which authorises the worker to make a product without reference to another authority
Indicator of demand	An indicator of demand may include: • kanban bin, ticket or similar • some other indicator of demand pull which authorises production or movement of an item (in some plants, this may also include authorisation using SCADA software) In continuous operations organisations, production is measured in terms of production rate (e.g. kg/h, tonne/day) and rate is increased/decreased according to the flow authorisation which may be a kanban (e.g. ticket, order from a supplier) or may be a SCADA signal from a remote facility (e.g. customer tank) saying that resupply is required or similar
Ticket	A ticket may include: • kanban or some other record, paper or electronic, which constitutes the whole or part of the flow authorising system (where kanban bins are used, there may be no other record)
Kanban	Kanban refers to: • a card or sheet used to authorise production or movement of an item and may vary in format or

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	content between organisations and departments
SCADA	SCADA refers to: • a number of systems which automatically collect critical process data, perform required mathematical manipulations on it and then make control decisions and/or give required information to personnel for action
Pull system	A pull system refers to: • an operations planning system based on making on demand, as opposed to a push system based on making for stock using a sales forecast
Procedures	Procedures may include: • work instructions • standard operating procedures • formulas/recipes, batch sheets, temporary instructions and similar instructions provided for the smooth running of the plant • good operating practice as may be defined by industry codes of practice (e.g. good manufacturing practice (GMP) and responsible care) and government regulations Procedures may be: • written, verbal, computer-based or in some other format

Unit Sector(s)

Unit sector Competitive systems and practices

Custom Content Section

Not applicable.

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MSS402040A Apply 5S procedures

Modification History

New unit, superseding MSACMT240A Apply 5S procedures in a manufacturing environment - Equivalent

Unit Descriptor

This unit of competency covers the skills and knowledge required by an employee to apply 5S procedures to their own job and work area. The unit assumes the employee has a particular job and an allocated work area and that processes in the work area are known by the individual.

Application of the Unit

This unit applies to an individual in an organisation who works in an operational position as part of production, maintenance, logistics, and so on. The unit can also apply to individuals in other organisations who have a discrete role and responsibility for individually managed processes. For employees in an office, the specific office-related unit *MSS402041A Apply 5S* in an office should be selected.
This unit applies where an organisation has decided to embark on a competitive systems and practices strategy and as part of this has adopted the philosophy of 5S as one of the tools to improve performance. The employee needs to apply 5S to their job and work area and maintain the housekeeping and other standards set by 5S.
This unit requires the application of skills associated with planning and organising, problem solving and self-management, in order to identify and implement 5S housekeeping practices.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Sort needed items from unneeded	1.1	Identify all items in the work area
		1.2	Sort items to achieve deliverables and value expected by downstream and final customers
		1.3	Sort items required for regulatory or other required purposes
		1.4	Place any non-essential item in a appropriate place other than the workplace
		1.5	Regularly check that only essential items are in the work area
2	Set the workplace in order	2.1	Identify the best location for each essential item
		2.2	Place each essential item in its assigned location
		2.3	After use immediately return each essential item to its assigned location
		2.4	Regularly check that each essential item is in its assigned location
3	Shine the work area	3.1	Keep the work area clean and tidy at all times
		3.2	Conduct regular housekeeping activities during shift
		3.3	Ensure the work area is neat, clean and tidy at both beginning and end of shift

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4	Standardise activities	4.1	Follow procedures
		4.2	Follow checklists for activities, where available
		4.3	Keep the work area to specified standard
5	Sustain the 5S system	5.1	Clean up after completion of job and before commencing next job or end of shift
		5.2	Identify situations where compliance to standards is unlikely and take actions specified in procedures
		5.3	Inspect work area regularly for compliance to specified standard
		5.4	Recommend improvements to lift the level of compliance in the workplace

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- communicating with others to clarify issues during 5S implementation, communicate results and contribute suggestions for improvement
- visualising operations in terms of flow and contribution to customer outcomes
- planning own tasks in implementation of 5S
- implementing 5S in own work area according to instructions
- identifying waste (muda)
- prioritising activities and items
- reading and interpreting documents describing procedures
- recording activities and results against templates and other prescribed formats
- working with others
- solving problems

Required knowledge

Required knowledge includes:

- operations and processes relevant to own job
- meaning and application of 5S steps to own job and work area
- principles of efficient workplace organisation
- purposes of 5S
- methods of making/recommending improvements

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to: • identify own tasks and responsibilities and relate them to organisation and customer requirements

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	• identify and explain the stages of 5S • implement 5S in own work area • identify waste (muda) in the work area.
Context of and specific resources for assessment	Assessment of performance must be undertaken in a workplace using or implementing one or more competitive systems and practices. Access may be required to: • workplace procedures and plans relevant to work area • specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and procedures relevant to the assessee • documentation and information in relation to production, waste, overheads and hazard control/management • reports from supervisors/managers • case studies and scenarios to assess responses to contingencies.
Method of assessment	A holistic approach should be taken to the assessment. Competence in this unit may be assessed by using a combination of the following to generate evidence: • demonstration in the workplace • workplace projects • suitable simulation • case studies/scenarios (particularly for assessment of contingencies, improvement scenarios, and so on) • targeted questioning • reports from supervisors, peers and colleagues (third-party reports) • portfolio of evidence. In all cases it is expected that practical assessment will be combined with targeted questioning to assess underpinning knowledge. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the candidate and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Competitive systems and practices	Competitive systems and practices may include, but are not limited to: • lean operations • agile operations • preventative and predictive maintenance approaches • monitoring and data gathering systems, such as Systems Control and Data Acquisition (SCADA) software, Enterprise Resource Planning (ERP) systems, Materials Resource Planning (MRP) and proprietary systems • statistical process control systems, including six sigma and three sigma • Just in Time (JIT), kanban and other pull-related operations control systems • supply, value, and demand chain monitoring and analysis • 5S • continuous improvement (kaizen) • breakthrough improvement (kaizen blitz) • cause/effect diagrams • overall equipment effectiveness (OEE) • takt time • process mapping • problem solving • run charts • standard procedures • current reality tree Competitive systems and practices should be interpreted so as to take into account: • the stage of implementation of competitive systems and practices • the size of the enterprise • the work organisation, culture, regulatory

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	environment and the industry sector
5S	5S is a system of work organisation originally developed in Japan based around housekeeping principles. A close translation of the five stages in the housekeeping approach is: • sort • set in order • shine • standardise • sustain
Sort	Sort involves keeping only what is absolutely necessary for the processes in the work area. Sort includes: • clearing the work area of all non-essential equipment and materials Non-essential items are those not required to either produce product, conduct process or operations, or make required adjustments to equipment during process or operations
Set in order	Set in order includes: • assigning required equipment and materials appropriate locations in the work area
Shine	Shine includes: • keeping the work area clean at all times. This should be carried out to a regular daily schedule against allowed time and, on most occasions, at the end of a job
Standardise	Standardising includes: • activities that help maintain the order and the housekeeping standards • using procedures and checklists developed from a procedure

Sustain	Sustain includes:
	• making sure that daily activities are completed every day regardless of circumstance
	• cleaning up after a job
	• undertaking inspections, including:
	  • informal inspections carried out often, at least weekly
	  • formal inspections carried out at least monthly

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	• generating continuous improvement actions from daily activities • following up specific actions to generate continuous improvement
Items in work area	Items in work area may include: • tools • jigs/fixtures • materials/components • plant and equipment • manuals • personal items (e.g. bags, lunch boxes and posters) • safety equipment and personal protective equipment • other items which happen to be in the work area
Procedures	Procedures may include: • work instructions • standard operating procedures • formulas/recipes • batch sheets • temporary instructions and similar instructions provided for the operation of the plant • good operating practice as may be defined by industry codes of practice (e.g. good manufacturing practice (GMP) and responsible care) and government regulations Procedures may be: • written, verbal, computer based or in some other format

Unit Sector(s)

Unit sector Competitive systems and practices

Custom Content Section

Not applicable.

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MSS402080A Undertake root cause analysis

Modification History

New unit, superseding MSACMT280A Undertake root cause analysis - Equivalent

Unit Descriptor

This unit of competency covers the skills and knowledge required to undertake root cause analysis (RCA) by any person. This will often be undertaken by people working in a team. This unit also covers the competencies needed by operators to contribute to an advanced maintenance strategy using RCA coupled with diagrams and charts.

Application of the Unit

This unit applies to individuals working in an organisation which is applying competitive systems and practices strategies. The unit applies to the formal problem solving to root cause that the individual must undertake in their own work area or where the individual contributes to problem solving to root cause as part of a team.
This unit requires an ability to seek and apply information from a variety of sources in order to inform RCAs. Initiative and enterprise is also required to identify quick fix and permanent solutions to problems.
Where training in a wider range of problem solving techniques and tools is required the unit MSAPMSUP390A Use structured problem solving tools should be selected.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

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Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Recognise problems	1.1	Identify features or occurrences indicative of a problem
		1.2	Use appropriate tools, techniques and charts to define the problem
2	Implement quick fix	2.1	Recommend a quick fix within the scope of competency and authority
		2.2	Use technology or processes relevant to the problem to implement quick fix
3	Determine root cause	3.1	Identify a range of possible causes
		3.2	Gather data and other information to eliminate or confirm possible causes
		3.3	Use available data and information to link causes and effects
		3.4	Seek assistance, as required
		3.5	Identify root cause

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4	Develop permanent solution	4.1	Identify a range of methods to eliminate the root cause or break the cause tree
		4.2	Select the most appropriate solution
		4.3	Liaise with relevant people
		4.4	Recommend or implement solution within the limits of competency and authority
		4.5	Monitor impact of solution and make further recommendations, as required

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- cooperating and working with others on problem solving
- assessing and recording information from a variety of sources
- defining potential problems factually, including:
  - location and extent of problem or incident
  - sequence of events where relevant
  - extent of deviation from normal operation or performance
- analysing potential problems across a range of varied activities and knowledge applications
- reading and constructing simple charts, such as cause and effect diagrams

Required knowledge

Required knowledge includes:

- RCA methodology, including difference between quick fixes and root cause elimination or breaking of causal tree
- principles and normal operation of equipment, plant and processes in own work area sufficient to undertake a RCA and propose solutions
- common variances to normal performance that are indicators of a problem
- use of relevant analysis tools (e.g. cause/effect diagrams, Pareto charts and 5 Whys)
- operations in own work area

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to: • undertake problem identification • use appropriate processes to achieve root cause

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	identification • prioritise solutions • recommend solutions and implementation procedures to problems within own area and range of technical skills and knowledge • evaluate implementation of solutions.
Context of and specific resources for assessment	Assessment of performance must be undertaken in a workplace using or implementing one or more competitive systems and practices. Access may be required to: • workplace procedures and plans relevant to work area • specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and procedures relevant to the assessee • documentation and information in relation to production, waste, overheads and hazard control/management • reports from supervisors/managers • case studies and scenarios to assess response to contingencies.
Method of assessment	A holistic approach should be taken to the assessment. Competence in this unit may be assessed by using a combination of the following to generate evidence: • demonstration in the workplace • workplace projects • suitable simulation • case studies/scenarios (particularly for assessment of contingencies, improvement scenarios, and so on) • targeted questioning • reports from supervisors, peers and colleagues (third-party reports) • portfolio of evidence. In all cases it is expected that practical assessment will be combined with targeted questioning to assess underpinning knowledge. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
Guidance information for	Assessment processes and techniques must be culturally

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assessment	appropriate and appropriate to the oracy, language and literacy capacity of the candidate and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Competitive systems and practices	Competitive systems and practices may include, but are not limited to: • lean operations • agile operations • preventative and predictive maintenance approaches • monitoring and data gathering systems, such as Systems Control and Data Acquisition (SCADA) software, Enterprise Resource Planning (ERP) systems, Materials Resource Planning (MRP) and proprietary systems • statistical process control systems, including six sigma and three sigma • Just in Time (JIT), kanban and other pull-related operations control systems • supply, value, and demand chain monitoring and analysis • 5S • continuous improvement (kaizen) • breakthrough improvement (kaizen blitz) • cause/effect diagrams • overall equipment effectiveness (OEE) • takt time • process mapping • problem solving • run charts • standard procedures • current reality tree Competitive systems and practices should be interpreted so as to take into account:

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	• the stage of implementation of competitive systems and practices • the size of the enterprise • the work organisation, culture, regulatory environment and the industry sector
Features or occurrences indicative of a problem	Examples of features or occurrences indicating problems include: • variation to normal plant or equipment operation • unplanned or non-conforming process or operations outcomes • out of specification products • excess scrap • accidents and emergencies • regulatory breaches • customer returns and complaints • reduction or loss of sales
Root cause	There are many possible causes of any problem. The root cause contrasts with other possible causes of a problem which when eliminated have no impact or only ameliorate the problem. Elimination of the root cause permanently eliminates the problem. There should only be one root cause for any problem and so the analysis should continue until this one cause is found.
Cause tree	The series of causes is referred to as the cause tree. Not all root causes are accessible and able to be eliminated. Breaking the cause tree is such a way that the problem cannot recur is an acceptable alternative. Not all situations can wait for the RCA and eventual elimination of the root cause as there may be serious current impacts. The quick fix will control these immediate impacts, but does not eliminate the root cause.
Quick fix	A quick fix is not a short cut or side step for a permanent solution to the root cause. It is a necessary step designed to control the immediate impacts of a problem, for example, to prevent ongoing errors or to ameliorate damage.
Appropriate techniques/charts	Appropriate techniques/charts may include: • control charts • Pareto charts • run charts • flow charts

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	• cause and effect diagrams • tree diagrams • 5 Whys analysis

Unit Sector(s)

Unit sector Competitive systems and practices

Custom Content Section

Not applicable.

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MSS402081A Contribute to the application of a proactive maintenance strategy

Modification History

New unit, superseding MSACMT281A Contribute to the application of a proactive maintenance strategy - Equivalent

Unit Descriptor

This unit of competency covers the skills and knowledge required to make a positive contribution to proactive maintenance strategies, including actions that contribute to equipment uptime and overall equipment effectiveness (OEE).

Application of the Unit

This unit applies to an individual in an organisation which is following a predictive, preventative or reliability-centred maintenance strategy and which requires commitment from all employees. The employee should 'own' their equipment/plant and take an active part in the implementation of the strategy within the scope of their authority.
This unit requires the application of skills associated with accessing and maintaining equipment/plant documentation, It also requires problem solving, initiative and enterprise to continually monitor and maintain operational performance of equipment/plant used in work role.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Maintain equipment/plant	1.1	Keep equipment/plant within area of responsibility clean
		1.2	Ensure equipment/plant is serviced and adjusted, as required, in accordance with procedures and own level of responsibility
		1.3	Access manufacturer manuals and specifications, where required, to expand knowledge on the maintenance of equipment/plant
		1.4	Access and update documentation on equipment/plant operation and maintenance as appropriate to workplace procedures
2	Monitor operation of equipment/plant	2.1	Regularly check key conditions of the equipment/plant as defined in workplace procedures
		2.2	Regularly check equipment/plant OEE
		2.3	Note any deviation from conditions specified in procedures
		2.4	Identify any previous occurrences of this deviation
3	Identify deviations and patterns	3.1	Identify any previous occurrences of a deviation
		3.2	Identify any related deviations which have occurred
		3.3	Identify any unusual occurrence which may be related to a deviation

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4	Take action appropriate to competency and authority on deviation	4.1	Liaise with relevant people regarding the deviation and the solution
		4.2	Implement solution and/or assist with the implementation of the solution, as appropriate

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- reading and interpreting electronic and hard copy plant, equipment, and process instructions and documents, including where used:
  - work instructions
  - standard operating procedures
  - workshop manuals and instructions from equipment manufacturers in regards to plant or equipment operation, regular maintenance, troubleshooting, and record of use or production
  - production and batch sheets
  - temporary instructions
  - other provided operating instructions
- examining equipment procedures, products and processes for possible causes of deviations from patterns of normal use
- interpreting OEE rates
- servicing and maintaining plant and equipment consistent with area of responsibility and own technical skills

Required knowledge

Required knowledge includes:

- normal behaviour of the equipment/plant
- indicators of abnormal performance
- principles of operation of plant and equipment sufficient to recognise problems and propose solutions
- appropriate cleaning and adjusting for the equipment/plant/area as required by procedures
- concept of OEE as: *availability x performance x quality rate*

where:

  - availability takes into account losses due to breakdown, set up and adjustments
  - performance takes into account losses due to minor stoppages, reduced speed and idling
  - quality rate takes into account t losses due to rejects, re-works and start-up waste

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to: • recognise deviations from normal performance patterns and deal with them appropriately • undertake operational service and maintenance on plant and equipment according to instructions.
Context of and specific resources for assessment	Assessment of performance must be undertaken in a workplace using or implementing one or more competitive systems and practices. Access may be required to: • workplace procedures and plans relevant to work area • specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and procedures relevant to the assessee • documentation and information in relation to production, waste, overheads and hazard control/management • reports from supervisors/managers • case studies and scenarios to assess responses to contingencies.
Method of assessment	A holistic approach should be taken to the assessment. Competence in this unit may be assessed by using a combination of the following to generate evidence: • demonstration in the workplace • workplace projects • suitable simulation • case studies/scenarios (particularly for assessment of contingencies, improvement scenarios, and so on) • targeted questioning • reports from supervisors, peers and colleagues (third-party reports) • portfolio of evidence. In all cases it is expected that practical assessment will be combined with targeted questioning to assess underpinning knowledge.

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	Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the candidate and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Competitive systems and practices	Competitive systems and practices may include, but are not limited to: • lean operations • agile operations • preventative and predictive maintenance approaches • monitoring and data gathering systems, such as Systems Control and Data Acquisition (SCADA) software, Enterprise Resource Planning (ERP) systems, Materials Resource Planning (MRP) and proprietary systems • statistical process control systems, including six sigma and three sigma • Just in Time (JIT), kanban and other pull-related operations control systems • supply, value, and demand chain monitoring and analysis • 5S • continuous improvement (kaizen) • breakthrough improvement (kaizen blitz) • cause/effect diagrams • OEE • takt time • process mapping • problem solving

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	• run charts • standard procedures • current reality tree Competitive systems and practices should be interpreted so as to take into account: • the stage of implementation of competitive systems and practices • the size of the enterprise • the work organisation, culture, regulatory environment and the industry sector
Uptime	Uptime refers to: • the overall availability of the plant – it is the inverse of downtime or the unavailability of the plant. Ideal uptime is 100%
Procedures	Procedures may include: • work instructions • standard operating procedures • formulas/recipes • batch sheets • temporary instructions and similar instructions provided for the smooth running of the plant • good operating practice as may be defined by industry codes of practice (e.g. good manufacturing practice (GMP) and responsible care) • government regulations Procedures may be: • written, verbal, computer-based or in some other format

Unit Sector(s)

Unit sector Competitive systems and practices

Custom Content Section

Not applicable.

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NWP209B Use maps, plans, drawings and specifications

Modification History

NWP209B Release 2: Layout adjusted. No changes to content.
NWP209B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to read and interpret maps, plans, drawings and specifications.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field and operational staff involved in the location, construction and maintenance or repair of assets, such as plants, pump stations and infrastructure.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit of competency contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Interpret maps, plans and drawings.	1.1 Identify main ***types of maps***, ***plans***, ***drawings and specifications*** used to support work tasks. 1.2 Identify parts of water systems and their interrelationship on a range of drawing types. 1.3 Interpret commonly used symbols and abbreviations. 1.4 Interpret function of the legend. 1.5 Verify latest version of map, plan or drawing.
2 Use maps and site plans to support work activities.	2.1 Apply organisation's ***system for managing maps and plans***. 2.2 Apply relevant ***technologies*** used to gather, record and monitor, map and plan data. 2.3 Identify function and ***key features of maps and site plans*** in the planning of work. 2.4 Identify ***orientation of the site***. 2.5 Identify and isolate access from roadways to work site. 2.6 Determine materials and distances from plans and drawings.
3 Read and interpret specifications.	3.1 Relate specifications to particular maps and plans and identify quality standards. 3.2 Identify and determine types of details from works specifications.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- read and interpret maps, plans, drawings and specifications
- measure accurately
- communicate effectively
- work effectively as part of a team
- use literacy skills in regard to verbal and written communication in the workplace
- use information provided in maps, plans and drawings to complete a job and in different work situations

Required knowledge:

- measurements and calculations
- contours
- datum points
- planes
- gradients
- sections
- orthographic projection
- symbols
- dimensions
- terminology

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability toread and interpret maps, plans, drawings and specifications including:

- locating correct maps, plans, drawings and specifications for work tasks
- interpreting correctly all relevant information in maps, plans, drawings and specifications to enable the work to be performed correctly, effectively and according to organisational quality standards

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based

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activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Types of maps, ***plans***, ***drawings and specifications*** may include:

- urban and rural topographical maps
- site plans and elevations
- process flow sheets
- survey plans
- sectional plans and elevations
- channel drainage plans
- pipe system plans
- location of assets plans
- details and specifications providing illustrations and dimensions

System for managing maps and plans used within organisation may be:

- geographic information systems
- electronic plans management systems
- manual systems
- hard copy systems

Technologies used to gather, record and monitor map and plan data may:

- vary across organisations
- include use of global positioning system (GPS) technology and require the use of portable navigation devices by operators

Key features of maps and site plans will include combinations of:

- shape and orientation of site
- roads
- railways
- easements
- existing buildings and structures
- services, including:
  - drainage
  - sewerage
  - gas
  - water
  - electricity and telecommunications
- dimensions
- grades of pipelines and channels
- tree preservation orders
- geographical features
- power and transmission lines
- heritage and cultural features

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- types of structure, including:
  - buildings
  - bridges
  - fabricated towers
  - fences
  - pipelines
  - regulators
  - poles
- environmental barriers
- environmental features, including:
  - fauna and flora habitats
  - cultural features
  - heritage features
  - water catchments
- shape of structure and building
- service requirements
- location of plant and equipment
- vertical and horizontal measurements
- clearance distance
- geological features
- service layouts
- bore and casing details

Orientation of the site may include:

- relationship to north
- currency of plan
- relationship between plan and site

Unit Sector(s)

Not applicable.

Competency field

Common.

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NWP210B Perform basic water quality tests

Modification History

NWP210B Release 2: Layout adjusted. No changes to content.
NWP210B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to perform basic water quality tests.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field and operational staff with responsibility for preparing for, conducting and reporting on basic water quality tests in general water industry and water treatment operations.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit of competency contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for basic water quality tests.	1.1 Receive instructions for conducting and recording ***basic water quality tests*** and confirm with appropriate personnel. 1.2 Confirm ***testing details*** and ***plan testing work*** according to ***legislative and organisational requirements***. 1.3 Select, fit and use personal protective equipment specified for routine water tests. 1.4 Prepare and check ***testing equipment*** according to organisational requirements.
2 Conduct basic water quality tests.	2.1 Identify and check correct samples for testing and report ***abnormal sample characteristics***. 2.2 Conduct basic water quality tests according to organisational requirements. 2.3 ***Maintain integrity of samples*** during testing. 2.4 Identify ***atypical data*** and take appropriate action.
3 Finalise work.	3.1 Record relevant ***information*** according to organisational requirements. 3.2 Dispose of samples and clean and store test equipment according to organisational procedures. 3.3 Clear and restore work area according to organisational requirements.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- conduct basic water quality tests
- calibrate testing equipment
- operate testing equipment
- conduct sub-sampling
- dispose of samples and waste
- communicate effectively
- produce reports and logs
- perform relevant work-related calculations
- work effectively as part of a team
- use literacy skills in regard to verbal and written communication in the workplace
- interpret work requirements

Required knowledge:

- range and purpose of basic water quality testing
- test procedures
- abnormal characteristics of water samples
- atypical test result data
- relevant work-related calculations
- maintenance and storage of reagents
- requirements for maintaining sample integrity
- documentation procedures for test results
- sample and waste disposal procedures
- relevant legislative and organisational requirements

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to perform basic water quality tests by:

- interpreting testing requirements and procedures
- preparing, checking and using equipment correctly
- conducting at least three different types of test safely while maintaining the integrity of samples
- recording all relevant information

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based

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activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Basic water quality tests include:

- range of tests required for competent performance of work tasks in the organisational context
- should comprise at least three of the following types of test:
  - pH
  - temperature
  - electrical conductivity
  - microscopy
  - turbidity
  - colour
  - chlorine residual
  - jar testing
  - hardness
  - dissolved oxygen

Testing details may include:

- locations, including:
  - on-site testing
  - field-based testing
  - laboratory
- range of testing procedures and techniques that apply to organisational, plant or field sites
- variety of samples to be tested
- testing equipment to be used
- test reporting systems

Plan testing work may include:

- interpretation of instructions and directions
- timelines
- interaction and communication with team members and individuals
- interpretation of legislative and organisational requirements

Legislative and organisational requirements may include:

- relevant federal and state or territory legislation and regulations
- codes of practice, associated standards and guidance material
- documented organisational policies, manuals and induction programs

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	• relevant community planning and development agreements, such as land care agreements

Testing equipment may include:	• portable meters, such as:
	  • pH meters
	  • electrical conductivity meter
	  • thermistors
	  • comparators
	  • pocket colorimeters
	  • dissolved oxygen meters
	• test kits
	• microscopes
	• thermometers

Abnormal sample characteristics may include:	• insufficient sample volume
	• odour
	• visible contaminants, such as:
	  • scum
	  • debris
	  • discolouration

Maintaining integrity of samples may include:	• application of correct:
	  • holding time
	  • storage procedures
	  • sub-sampling procedures

Atypical data may include:	• results that fall outside organisational range requirements • results that fall outside legislated range requirements
Information may include:	• time and logging of sample receipt and testing • visual observations • equipment identification • atypical results • test results

Unit Sector(s)

Not applicable.

Competency field

Common.

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NWP218B Perform and record sampling

Modification History

NWP218B Release 2: Layout adjusted. No changes to content.
NWP218B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to collect and prepare water and wastewater samples according to legislative and organisational standard operating procedures.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field and operational staff with specific responsibility for collecting grab or composite water samples.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for water quality sampling.	1.1 Confirm required ***samples***, procedures for sampling and sampling locations according to ***organisational requirements***. 1.2 Select ***sampling equipment*** according to specified samples required and appropriate ***sample preservation methods***. 1.3 Identify, check and prepare materials, equipment and resources required to satisfy job plan according to organisational requirements. 1.4 ***Plan sampling work activities*** to comply with sampling plan and organisational requirements.
2 Conduct water quality sampling.	2.1 Collect samples ensuring that sample types, ***sampling locations*** and sampling times comply with sampling plan. 2.2 Maintain integrity of samples during sampling and label sample containers according to organisational requirements. 2.3 Follow approved safety procedures to limit hazards and contamination to self, work area and environment.
3 Record sampling data.	3.1 ***Record*** required information according to legislative and organisational requirements. 3.2 Report observations or measurements outside organisational guidelines or specifications for further action.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- prepare, collect, label and preserve water samples
- dispose of waste and spent samples correctly
- produce reports and logs
- plan work activities
- work effectively as part of a team
- perform task-related calculations
- identify and obtain resources
- follow plans and instructions
- apply procedures and standards
- communicate work requirements
- use literacy skills in regard to verbal and written communication in the workplace
- use personal protective equipment

Required knowledge:

- types and purposes of water samples
- procedures and techniques for water sampling
- water sample preparation, including:
  - prevention of contamination
  - volume of sample
  - appropriate containers
  - preservation
  - location selection
  - location maintenance
  - equipment
  - transportation
  - documentation procedures for water samples
  - disposal procedures for waste and excess water samples
- task-related calculations
- legislative and organisational policies, procedures and standards
- communication systems
- work planning processes
- effects of weather and conditions on work
- hazards associated with collection of water samples

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to perform basic water sampling by:

- planning and preparing for water sampling tasks
- collecting samples according to sampling plan
- maintaining integrity of water samples
- recording all required information

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the

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elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Samples may include:

- grab, composite or flow-weighted composite samples for:
  - microbiological testing
  - testing for chemical and physical characteristics

Organisational requirements may include:

- standard operating procedures
- Australian standards, for example AS/NZSÂ 5667 Water quality - sampling
- state Environment Protection Authority sampling guidelines
- legislative requirements
- OHS

Sampling equipment may include:

- buckets or wide-mouthed containers
- depth samplers
- sample dippers
- sterile sample containers:
  - plastic
  - glass
  - test-specific, such as acid washed
- weighted sample bottles
- dip tubes
- composite and discrete automatic samplers

Sample preservation methods may include:

- refrigeration
- freezing
- chemical addition, such as acidification
- shielding from direct sunlight
- filtration

Planning sampling work activities may include:

- interpretation of instructions and directions
- timelines
- interaction and communication with team members and individuals
- customer service requirements

Sampling locations may include:

- raw water supply, including:
  - surface water
  - groundwater
- water distribution and treatment systems
- wastewater collection and treatment systems

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Records may include:

- sample records, field detail sheets or chain of custody forms, including information such as:
  - time sample was taken
  - details of person collecting sample
  - sample point
  - volume of sample
- data gathered at time of collection
- pre-treatment
- preservation
- instructions to transporters

Unit Sector(s)

Not applicable.

Competency field

Common.

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NWP226B Prepare and restore work site

Modification History

NWP226B Release 2: Layout adjusted. No changes to content.
NWP226B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to prepare work sites prior to work and restore them on completion of work. The ability to follow work instructions, use a range of equipment and tools to prepare a safe work site and subsequently to restore the site to the required condition is essential to satisfactory performance.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field and operational staff performing a wide range of functions that support construction, maintenance and operations processes.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare for work.	1.1 Determine ***site preparation*** requirements from specifications, instructions and pre-work inspections.
	1.2 Identify and report potential risks to public and environment.
	1.3 Perform a site check according to ***legislative and organisational requirements*** to identify risks and prevent damage to other utilities.
	1.4 Select and check work site ***equipment***, ***tools and materials*** as appropriate to meet task and safety specifications.
	1.5 Select, fit and use personal protective equipment.
2 Prepare work site.	2.1 Position ***safety equipment and materials*** as required to prevent potential risks to public and environment.
	2.2 ***Store and secure equipment*** and materials as necessary.
	2.3 Use work site equipment, tools and materials according to regulatory and legislative requirements.
	2.4 Use manual or mechanical excavation equipment where required to achieve specifications.
	2.5 Provide appropriate drainage and diversion of site inflows from work site without ***damage to environment***.
3 Restore work site.	3.1 Use equipment, tools and materials according to regulatory and legislative requirements.
	3.2 Backfill and compact excavations according to specifications.
	3.3 Remove excess soil, debris and unwanted materials from site.
	3.4 ***Restore work site*** to meet environmental and organisational requirements.
4 Review, **record and report activities**.	4.1 Check, maintain and store equipment, tools and materials according to manufacturer guidelines and organisational procedures.
	4.2 Maintain workplace records as required.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- set up a site
- excavate backfill
- compact and reinstate site
- prepare site for planting and plant vegetation
- interpret plans, instructions and standard operating procedures
- use tools and equipment
- identify and respond to operational problems
- use communication systems
- use safety equipment and personal protective equipment
- identify hazards
- give and receive instructions
- use literacy skills in regard to verbal and written communication in the workplace
- communicate with customers and other employees

Required knowledge:

- OHS procedures
- personal work site safety
- public and site safety
- risk factors and potential hazards of site preparation and restoration
- environmental aspects of site preparation and restoration
- trenching, shoring and excavation management
- excavation procedures and site restoration
- relevant utilities and service bodies
- communication systems
- landscape and ground structure of work area
- equipment operation, capacity and limitations
- effects of weather and conditions on construction site or plant

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to prepare work sites prior to work and restore them on completion of work including:

- interpreting work requirements
- planning work site layout
- selecting appropriate work and safety equipment
- storing and securing materials and equipment safely
- clearing and preparing work site according to specifications
- restoring work site according to environmental and organisational procedures
- cleaning, maintaining and storing equipment
- completing relevant workplace documentation

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect

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and supplementary evidence

- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

Questioning will be appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Site preparation may include:	• interpreting plans • locating public utilities • setting out site • battering • shoring • scaffolding • excavating • directing traffic and the public
Legislative and organisational requirements may include:	• relevant federal and state or territory legislation and regulations • codes of practice, associated standards and guidance material • documented organisational policies, manuals and induction programs • relevant community planning and development agreements, such as land care agreements

Equipment, ***tools and materials*** may include:	• hand and power tools
	• lifting and winching equipment
	• mechanical excavation equipment
	• pneumatic and motorised equipment, including:
	  • compressors
	  • pneumatic spades and attachments
	  • motorised cutting equipment
	• revegetation and gardening supplies and plants
	• communication equipment
	• personal protective equipment

Safety equipment and materials may be used to ensure public and site safety when:	• positioning signs • erecting barricades • controlling access
Storing and securing equipment may include:	• stacking and securing pipes safely • placing equipment in locked storage during absence from site
Damage to environment is avoided or minimised by	• sediment control devices • erosion prevention

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using a range of techniques, including:	• diversion and collection structures
Restore work site using techniques, including:	• backfilling • compacting • planting or replanting vegetation • reinstating site

Unit Sector(s)

Not applicable.

Competency field

Common.

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NWP227B Control vegetation on a site

Modification History

NWP227B Release 2: Layout adjusted. No changes to content.
NWP227B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to control vegetation on a site by inspecting, identifying and treating weeds, plants and shrubs. The ability to plan and undertake work safely, including the safe handling of chemicals and equipment, is essential to performance.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field and operational staff involved in plant control but it does not reflect the requirements for undertaking plant control on the properties of third parties where further training and licensing requirements may apply.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare work.	1.1 Plan work according to work specifications, ***relevant legislation and organisational procedures***.
	1.2 Perform site check according to organisational requirements to prevent damage to other utilities and environment.
	1.3 Select and check ***equipment and personal protective equipment*** and material safety data sheets to meet safety requirements of task and site.
	1.4 Identify noxious weeds, plants and shrubs.
2 Treat vegetation.	2.1 Conduct monitoring programs to determine spread, growth rate and extent of problem caused by weeds.
	2.2 Store, handle, transport and mix chemicals and other control mechanisms according to relevant legislation and organisational procedures.
	2.3 Use ***processes*** to treat vegetation in a manner safe to all stakeholders and according to appropriate standards and organisational operational procedures.
	2.4 Implement controls according to organisational requirements to minimise environmental damage and deal with emergencies and spillage.
3 Check work and restore work site.	3.1 Clean equipment after use and prepare for safe storage or re-use.
	3.2 Identify potential hazards and dispose of waste according to organisational requirements.
4 Complete records and reports.	4.1 Record use of chemicals and control mechanisms according to legislative and organisational requirements.
	4.2 Complete work reports and documentation as required.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- identify and report operational problems
- produce reports and logs
- use personal protective equipment
- use tools and machinery
- use chemicals and other treatments
- follow plans, charts and instructions
- perform work-related calculations
- interpret material safety data sheets (MSDS)
- apply procedures and standards
- communicate with employees and customers
- work effectively as part of a team
- use communication equipment
- use literacy skills in regard to verbal and written communication in the workplace
- give and receive instructions

Required knowledge:

- environmental aspects of controlling vegetation
- relevant utilities and service bodies
- communication systems
- use, storage, handling and transport of hazardous substances
- landscape and ground structure of work area
- risk factors and potential hazards of vegetation control processes
- equipment operation, capacity and limitations
- effects of weather and conditions on use of chemical treatment, site or plant
- control systems
- materials handling
- landscape and ground structure of work area

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to control vegetation on a site by inspecting, identifying and treating weeds, plants and shrubs including:

- interpreting work requirements from given documentation
- identifying noxious weeds and appropriate control methods
- planning and preparing equipment and materials required for work
- treating vegetation according to legislative and organisational procedures
- identifying risks and implement controls
- restoring work site according to environmental and organisational requirements
- completing relevant documentation.

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations.

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning

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experience must include a combination of direct, indirect and supplementary evidence

- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit.

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Relevant legislation and organisational procedures include:

- relevant federal and state or territory legislation and regulations
- codes of practice, associated standards and guidance material
- documented organisational policies, manuals and induction programs
- relevant community planning and development agreements, such as land care agreements

Equipment and personal protective equipment may include:

- hand and power tools
- on- and off-road vehicles
- lifting and winching equipment
- mechanical excavation equipment
- chemicals and mixers
- chemical spraying apparatus
- mixing equipment and storage areas
- communication equipment
- gas detection equipment
- rescue equipment
- breathing apparatus
- other appropriate personal protective equipment, including goggles and gloves

Processes used to treat and control vegetation include:

- application of chemicals
- manual extraction
- use of genetic plant modification
- companion planting
- other environmental controls, including use of insects

Unit Sector(s)

Not applicable.

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Competency field

Common.

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NWP229B Repair minor structures

Modification History

NWP229B Release 2: Layout adjusted. No changes to content.
NWP229B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to construct and repair minor structural assets of the water industry, such as meter pits, erosion barriers and small weirs.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field and operational staff with specific responsibility for ensuring that small structural assets are constructed and repaired in a safe and timely manner.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare repair work.	1.1 Determine work requirements from plans, specifications and instructions.
	1.2 Select and check ***formwork***, ***materials and equipment*** required to ensure that safety requirements of task and site are met.
	1.3 Select, fit and use personal protective equipment.
	1.4 Conduct appropriate utility location activities prior to excavation according to ***legislative and organisational requirements***.
	1.5 Arrange appropriate site boundary protection according to organisational requirements.
2 Repair minor structures.	2.1 Inspect structures and determine appropriate ***repair techniques***.
	2.2 Apply appropriate repair techniques according to manufacturer guidelines and legislative and organisational requirements.
3 Complete and record work outcomes.	3.1 Check, maintain and store equipment, tools and materials according to manufacturer guidelines and organisational procedures.
	3.2 Restore work site to meet environmental and organisational requirements.
	3.3 Complete workplace records and process as required.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- undertake minor repairs to structures
- interpret plans, instructions and standard operating procedures
- follow procedures and standards
- use safety equipment and personal protective equipment
- use tools and machinery
- lay concrete
- insert water stop or seal
- identify hazards
- perform work-related calculations
- give and receive instructions
- work effectively as part of a team
- communicate with customers and other employees
- use literacy skills in regard to verbal and written communication in the workplace
- apply lock-out and tag-out procedures

Required knowledge:

- OHS procedures
- personal work site safety procedures
- construction calculations
- risk factors and potential hazards of minor structure construction and maintenance
- equipment operation
- formwork preparation and positioning
- methods of repairing concrete, brick and stone structures
- concrete placement techniques, including compaction
- water to cement ratio of concrete

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to repair work on minor structural assets of the water industry including:

- planning and preparing work site
- performing repair tasks according to manufacturer specifications and organisational requirements
- checking work, restoring work site, storing equipment and completing documentation

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the

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elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Formwork, ***materials and equipment*** may include:

- formwork, such as:
  - steel formwork
  - timber formwork
- equipment, such as:
  - personal protective equipment
  - hand and power tools
  - ties
  - chains
  - props
  - jacks
  - drainage aggregate
  - pipes
  - lifting and winching equipment
  - mechanical excavation equipment
- pneumatic and motorised equipment, including:
  - compressors
  - pneumatic spades and attachments
  - motorised cutting equipment
  - cable ways
  - travellers
- gauging stations
- small control weirs
- communication equipment

Legislative and organisational requirements may include:

- relevant federal and state or territory legislation and regulations
- codes of practice, associated standards and guidance material
- documented organisational policies, manuals and induction programs
- relevant community planning and development agreements, such as land care agreements

Repair techniques may include:

- quick-set cement
- cementitious materials
- proprietary equipment

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Unit Sector(s)

Not applicable.

Competency field

Common.

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NWP243B Operate bore fields and groundwater source systems

Modification History

NWP243B Release 2: Layout adjusted. No changes to content.
NWP243B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to operate bore fields and groundwater source systems. Monitoring the availability and quality of supply, and control of water flows from the source are also required, in conjunction with the ability to apply legislative and organisational requirements.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field staff operating bores and groundwater sources in urban or rural areas.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Monitor water quality and supply of bore field or groundwater source.	1.1 Determine work requirements or specifications, including required ***equipment***. 1.2 ***Monitor designated locations*** within groundwater sources area according to agreed schedule and ***legislative and organisational requirements***. 1.3 Monitor water depths according to agreed schedule and procedures. 1.4 Collect and record water samples according to organisational requirements. 1.5 Take water flow measurements to determine demand and usage rates.
2 Check source areas.	2.1 Identify potential hazards to public and environment and report them to relevant personnel. 2.2 Identify and report breaches of legislative and organisational requirements. 2.3 Respond to public enquiries in line with organisational requirements.
3 Regulate and report flows.	3.1 Regulate flow control mechanisms according to organisational requirements to maintain system supply. 3.2 Produce data relating to system demand adjustments according to organisational requirements.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- identify and respond to operational problems
- operate communications equipment
- use tools and equipment
- interpret plans, instructions and standard operating procedures
- perform work-related calculations
- follow procedures and standards
- use safety equipment and personal protective equipment
- identify hazards
- give and receive instructions
- communicate with customers and other employees
- operate effectively as part of a team
- measure water flows and water table levels
- select and collect samples
- identify control system faults
- identify and prevent well contamination
- adjust mechanical and electrical systems
- use literacy skills in regard to verbal and written communication in the workplace
- isolate mains and waterways

Required knowledge:

- OHS standards and requirements
- public and site safety
- system hydraulics and flushing
- system layout
- lock-out procedures for mechanical and electrical installations
- relevant utilities and service bodies
- communication systems
- environmental, landscape and ground structure of work area
- risk factors and potential hazards of groundwater source systems
- well contaminants
- equipment operation, capacity and limitations
- effects of weather and conditions on operation of site or plant
- sampling procedures
- water flow measurement
- control systems
- basic types of bore construction and principles

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to operate bore fields and groundwater source systems including:

- monitoring groundwater depth
- taking and processing water samples ready for testing
- taking and recording flow measurements
- monitoring groundwater sources and surrounding area
- reporting environmental problems and breaches
- operating flow control and regulation devices
- recording and reporting work activities

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency

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demonstrated over a period of time

- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Equipment used may include:

- electronic digital monitoring and metering systems
- recording systems
- communication equipment, including:
  - two-way radio
  - telephone
  - fax
- basic hand and power tools
- on- and off-road vehicles
- flow control and adjustment equipment
- pumping systems, including:
  - submersible
  - centrifugal
  - multiple stage
  - deep well pumps
- valving systems, including:
  - sluice
  - blade
  - gate
  - non-return
  - pressure reducing
- water table level measuring devices
- personal protective equipment

Monitoring designated locations may require:

- interaction and communication with other employees, other authorities and general public
- visual observation
- directing traffic and the public
- implementation of reporting procedures that may also include procedures for implementation of by-laws, organisational policies and statutory requirements

Legislative and organisational requirements may include:

- relevant federal and state or territory legislation and regulations
- codes of practice, associated standards and guidance material
- documented organisational policies, manuals and induction programs

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- relevant community planning and development agreements, such as land care agreements

Unit Sector(s)

Not applicable.

Competency field

Collection and distribution.

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NWP245B Maintain tanks and water storage assets

Modification History

NWP245B Release 2: Layout adjusted. No changes to content.
NWP245B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to maintain and repair tanks and water storage assets, including reservoirs, balancing storages, sand dams and ring dams.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field staff with specific responsibility for ensuring that maintenance and repair of tanks and water storage assets are completed in a safe and timely manner.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare for work.	1.1 Determine ***work requirements*** for maintenance and repair of ***tanks and water storage assets*** from specifications and instructions.
	1.2 Plan work according to job requirements using relevant plans, drawings, standards and technical data.
	1.3 Check coordination issues with relevant personnel, including isolations and permits to work.
	1.4 Identify, check and prepare materials, ***equipment*** and resources required to satisfy job plan according to ***legislative and organisational requirements***.
	1.5 Select, fit and use personal protective equipment.
2 Clean and maintain water tanks and water storage assets.	2.1 Monitor, operate and tag flow-regulating devices to isolate tanks according to organisational requirements.
	2.2 Use safety equipment and follow safety procedures for entry into storages.
	2.3 Carry out de-silting processes and clean and flush assets according to organisational requirements.
	2.4 Repair minor structural damage to storage assets and tanks and identify and report major faults according to organisational procedures.
	2.5 Check and operate flow-regulating devices to return tank to service.
	2.6 Check maintenance and repairs to tanks and water storage assets to ensure specifications are met.
	2.7 Check level sensing equipment and alarms to ensure effective operation.
3 Review, **report and record work**.	3.1 Check, maintain and store equipment, tools and materials according to manufacturer guidelines and organisational procedures.
	3.2 Restore work site to meet environmental and organisational requirements.
	3.3 Maintain workplace records as required.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- maintain structures, fittings and assets
- conduct earthworks
- identify and respond to operational problems
- produce reports and logs
- use safety and personal protective equipment
- use tools and equipment
- follow plans and instructions
- perform work-related calculations
- apply procedures and standards
- communicate with employees and customers
- work effectively as part of a team
- use communication systems
- give and receive instructions
- identify system faults
- use literacy skills in regard to verbal and written communication in the workplace
- identify hazards

Required knowledge:

- system hydraulics basics
- system layout
- environmental aspects of maintenance
- lock-out procedures for mechanical and electrical installations
- relevant utilities and service bodies
- communication systems
- hazardous materials handling
- material safety data sheets (MSDS)
- landscape and ground structure of work area
- risk factors and potential hazards of maintenance processes
- equipment operation, capacity and limitations
- control systems
- pipes and fittings
- disinfection of systems and chemical usage

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to perform maintenance and repair work on tanks and water storage assets by:

- planning and preparing work site
- performing maintenance and repair tasks according to manufacturer specifications and organisational requirements
- checking work, restoring work site, storing equipment and completing documentation

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the

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elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Work requirements may include:

- work site boundaries
- types of tanks and assets to be maintained or repaired
- methods to be used
- risk assessment and preventative measures

Tanks and water storage assets may include:

- pipes
- valves
- controlling equipment of polyvinyl chloride (PVC)
- polyethylene
- mild steel cement lined
- ductile iron cement lined
- cast iron cement lined
- asbestos cement
- copper
- glass reinforced piping
- structures, including:
  - meter pits
  - person access chambers or pits
  - valve chambers
  - regulators
  - erosion barriers
  - head walls
  - thrust blocks
  - fittings, including:
    - hydrants
    - sluices
    - scours
    - main taps
- jointing systems for pipe types, e.g. gibault
- tapping bands
- tension bands
- solvent cement joints
- compression ring joints
- bolted flanges
- electrofusion

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Equipment used may include:	• welded
	• cathodic protection
	• hand and power tools
	• lifting and winching equipment
	• mechanical excavation equipment
	• pneumatic and motorised equipment, including:
	  • compressors
	  • pneumatic spades and attachments
	  • motorised cutting equipment
	  • on- and off-road vehicles
	  • portable pumps
	• communication equipment
	• breathing apparatus
	• gas detection equipment
	• rescue equipment
	• appropriate personal protective equipment

Legislative and organisational requirements may include:	• relevant federal and state or territory legislation and regulations • codes of practice, associated standards and guidance material • documented organisational policies, manuals and induction programs • relevant community planning and development agreements, such as land care agreements

Unit Sector(s)

Not applicable.

Competency field

Collection and distribution.

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NWP247A Maintain catchment and surrounding areas

Modification History

NWP247A Release 2: Layout adjusted. No changes to content.
NWP247A Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to maintain surface catchment areas and associated rivers, lakes, water bodies, dams, water storages and groundwater areas in a manner that meets organisational standards and contributes to the maintenance of water quality, and the protection of the environment and the public. The ability to apply organisational procedures, apply procedures to maintain environmental conditions, undertake maintenance and report outcomes is essential to performance.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field staff with specific responsibility for maintaining catchment and surrounding areas and contributing to catchment management and control.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for work.	1.1 Access and review catchment inspection records describing maintenance requirements for action. 1.2 Identify and apply work requirements and timelines for ***performing maintenance tasks*** of catchments and surrounding areas. 1.3 Assess site, ***equipment*** and methods to be used for hazards or risks and apply appropriate control measures using safe work procedures. 1.4 Plan maintenance work to be conducted within required timeframe, using allocated resources effectively and according to legislative and organisational requirements.
2 Maintain environmental condition of waterways and surrounding areas.	2.1 Remove dead livestock or native fauna from waterways and surrounding catchments and dispose of according to organisational requirements. 2.2 Remove flood debris from waterways and surrounding areas according to organisational procedures. 2.3 Carry out fuel reduction burns according to organisational procedures. 2.4 Apply ***basic control measures*** to contain or control chemical spills or contaminated water supplies. 2.5 Identify and report potential or emerging changes to environmental conditions according to organisational requirements.
3 Eradicate noxious weeds and feral pests.	3.1 Identify noxious weeds and feral pests that are contributing to degradation of catchment and surrounding areas. 3.2 Use standard organisational procedures for managing and removing noxious weeds and feral pests according to safe work practices. 3.3 Compile reports on eradication process according to organisational procedures.
4 Perform minor maintenance.	4.1 Identify ***infrastructure*** requiring minor maintenance. 4.2 Apply erosion control measures for waterways and surrounding areas. 4.3 Make repairs using appropriate equipment and resources to a standard that meets organisational requirements. 4.4 Provide reports of maintenance performed according to organisational procedures.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- undertake inspections of catchment and surrounds
- identify and respond to maintenance problems
- use communication systems
- provide basic verbal or written reports
- follow plans and instructions
- perform work-related calculations
- follow organisational procedures and standards
- use safety equipment and personal protective equipment
- communicate with customers and other employees
- use literacy skills in regard to verbal and written communication in the workplace
- work effectively as part of a team

Required knowledge:

- environmental, landscape and ground structure of work area
- risk factors and potential hazards of surface water systems
- catchment emergency response procedures
- catchment security procedures
- operation of communication systems
- customer service
- effects of weather and conditions on operation of site or plant
- relevant utilities and service bodies
- equipment operation

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to maintain surface catchment areas including:

- interpreting work requirements
- monitoring and reporting environmental conditions
- maintaining catchment areas and removing debris and noxious weeds and pests according to legislative and organisational requirements
- performing minor maintenance tasks
- compiling reports

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency

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demonstrated over a period of time

- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Performing maintenance tasks may require:

- interaction and communication with other employees, other authorities and general public
- visual observation
- implementation of reporting procedures that may also include procedures for implementation of by-laws, organisational policies and statutory requirements
- bushcraft
- eradication of feral pests and noxious plants
- identification of declared flora
- fire suppression or fuel reduction procedures
- system layout

Equipment used may include:

- personal protective equipment
- electronic digital monitoring systems
- recording systems
- on- and off-road vehicle operation
- basic hand and power tools
- communication equipment, including:
  - two-way radio
  - telephone
  - fax
- small marine craft

Basic control measures may include:

- minor earthworks, such as bunding and diversions
- booms and other temporary bunding systems
- aeration
- eductor trucks
- hay bales
- geofabric and beaching

Infrastructure that may require minor maintenance includes:

- fences and gates
- buildings, plant and equipment
- signage
- roads, tracks and paths
- public facilities including:
  - bridges
  - boardwalks
  - display boards

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- campgrounds
- picnic areas
- toilets
- fireplaces

Unit Sector(s)

Not applicable.

Competency field

Collection and distribution

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NWP253B Install and repair water services

Modification History

NWP253B Release 2: Layout adjusted. No changes to content.
NWP253B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to install and repair water service pipes running from the main supply to the consumer connection.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field staff with specific responsibility for ensuring that water pipes are installed and repaired in a safe and timely manner.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare for service installation.	1.1 Determine ***work requirements*** for installation of services from plans, specifications and organisational procedures. 1.2 Determine materials and configuration from plans, specifications and organisational procedures. 1.3 Determine location of other utilities and services according to ***legislative and organisational requirements***. 1.4 Identify and apply system operation requirements. 1.5 Select, fit and use ***equipment***, including personal protective equipment. 1.6 Determine location, size and number of tappings from plans, specifications and organisational procedures.
2 Drill and tap main pipe.	2.1 Set up and operate tapping machine according to manufacturer specifications and organisational procedures. 2.2 Install main tap according to specifications and organisational requirements. 2.3 Recognise and correct faults or malfunctions in drilling and tapping. 2.4 Apply corrosion protection measures where required.
3 Install conduits under roads and pathways.	3.1 Coordinate installation of conduits with road and path construction. 3.2 Install conduits according to specifications, drawings and organisational requirements.
4 Install pipes and fittings.	4.1 Measure ***pipes*** and cut to length within acceptable tolerance for length and squareness. 4.2 Prepare pipe ends and make ***joints*** according to manufacturer specifications. 4.3 Set out configuration of pipes and ***fittings*** according to plans, specifications and organisational requirements, with allowance for thermal movement if required. 4.4 Recognise and correct joining faults or malfunctions. 4.5 Select bedding and backfill material and place according to manufacturer specifications and organisational requirements.
5 Maintain water system hygiene.	5.1 Store service pipes and fittings clear of potential pollutants or damaging substances and remove debris or filling from pipes before installation. 5.2 Flush service pipe work before final commissioning. 5.3 Plug pipe openings during work breaks.
6 Locate and repair leaks.	6.1 Determine locations of leaks and isolate and dewater. 6.2 Identify and apply electrical safety procedures.

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ELEMENT	PERFORMANCE CRITERIA
	6.3 Identify and apply appropriate repair techniques to maintain integrity of service.
7 Test water service.	7.1 Apply test or operational pressures to service and all joints.
	7.2 Check pipes, connections and fittings are operable without leakage under test or operational conditions.
8 Finalise work.	8.1 Check, maintain and store equipment, tools and materials according to manufacturer guidelines and organisational procedures.
	8.2 Restore work site to meet environmental and organisational requirements.
	8.3 Complete workplace records and process as required.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- install and repair service pipes and fittings
- identify control system faults
- use safety equipment and personal protective equipment
- use tools and equipment
- identify hazards
- work effectively as part of a team
- perform work-related calculations
- identify and respond to operational problems
- use communication systems
- interpret plans, instructions and procedures
- follow procedures and standards
- complete documentation
- use literacy skills in regard to verbal and written communication in the workplace
- communicate with customers and other employees

Required knowledge:

- OHS procedures
- personal work site safety
- risk factors
- equipment operation
- environmental aspects of service installation
- pipe systems and installation requirements
- characteristics of pipe materials
- work-related calculations
- systems' operation
- testing systems
- corrosion principles applicable to service pipes and fittings
- operation of water meters

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to install and repair water services between the main supply and customer connection by:

- planning work and preparing work site
- performing installation and repair tasks according to manufacturer specifications and legislative and organisational requirements
- ensuring system hygiene and operational performance
- checking work, restoring work site, storing equipment and completing documentation

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency

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demonstrated over a period of time

- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Work requirements may include:

- confined spaces
- lifting and moving materials in a trench

Legislative and organisational requirements may include:

- relevant federal and state or territory legislation and regulations
- codes of practice, associated standards and guidance material
- documented organisational policies, manuals and induction programs
- relevant community planning and development agreements, such as land care agreements

Equipment used may include:

- hand and power tools
- lifting and winching equipment
- mechanical excavation equipment
- pneumatic and motorised equipment
- pressure drilling and tapping machines
- pipe cutting and bending apparatus
- thread cutting equipment
- communication equipment
- bridging clamps
- insulating gloves
- personal protective equipment

Pipes may include:

- copper
- polybutylene
- brass
- polyethylene
- polyvinyl chloride (PVC)
- galvanised steel

Joints may be:

- threaded
- electrofusion
- push fit
- solvent welded
- butt welded
- compression
- silver soldered

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Fittings may include:

- tapping bands
- main taps
- ferrules
- ball valves
- dirt boxes
- meter boxes

Unit Sector(s)

Not applicable.

Competency field

Collection and distribution.

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NWP255B Maintain and repair wastewater collection assets

Modification History

NWP255B Release 2: Layout adjusted. No changes to content.
NWP255B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to maintain and repair pipes, drains and wastewater collection assets.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field staff with responsibility for ensuring that wastewater collection assets are maintained and repaired in a safe and timely manner.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare for maintenance.	1.1 Determine work requirements for maintenance and repair of ***assets*** from working drawings, plans, specifications and instructions.
	1.2 Select and check ***equipment and tools*** required to meet safety requirements of task and site.
	1.3 Select, fit and use personal protective equipment.
2 Conduct maintenance and repair work.	2.1 Locate and remove system chokes and blockages to achieve maximum system performance.
	2.2 Repair or replace leakages and damaged assets to meet test specifications.
	2.3 Repair or replace structures as required to meet operational, ***legislative and organisational requirements***.
	2.4 Check maintained and repaired assets to ensure that specifications have been met.
3 Finalise work.	3.1 Check, maintain and store equipment, tools and materials according to manufacturer guidelines and organisational procedures.
	3.2 Complete workplace records and process as required.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- install and repair appropriate assets
- clear chokes and blockages
- maintain assets
- identify and respond to operational problems
- use communication systems
- perform work-based calculations
- follow drawings, plans, specifications and instructions
- apply policies and procedures
- use safety and personal protective equipment
- work effectively as part of a team
- use tools and machinery
- identify hazards
- communicate with customers and other employees
- use literacy skills in regard to verbal and written communication in the workplace
- record work activities

Required knowledge:

- system hydraulics basics
- system layout
- system calculations
- environmental aspects of construction and maintenance
- lock-out procedures for mechanical and electrical installations
- relevant utilities and service bodies
- risk factors and potential hazards of locating underground utilities and services
- risk factors and potential hazards of installation and maintenance processes
- hazardous materials handling
- landscape and ground structure of work area
- equipment operation, capacity and limitations
- effects of weather and conditions on construction site or plant
- control systems
- pipes and fittings
- OHS procedures
- personal work site safety
- component parts
- repair and maintenance standard operating procedures

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to conduct maintenance and repair work on wastewater collection assets by:

- planning and preparing work site
- performing maintenance and repair tasks on pipe work and structures according to manufacturer specifications and organisational requirements
- checking work, restoring work site, storing equipment and completing documentation

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time

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- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

Questioning will be appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Assets may include:

- collection system's pipe work, including:
  - vitrified clay
  - reinforced concrete
  - polyvinyl chloride (PVC)
  - polyethylene
  - cast iron cement lined
  - ductile iron cement lined
  - glass reinforced piping
  - mild steel cement lined
- structures, including:
  - meter pits
  - valve pits
  - drop structures
  - regulators
  - erosion barriers
  - person access chambers and pits
  - head walls
  - thrust blocks
  - inspection shafts
  - controlling equipment
- fittings, including:
  - jointing systems for pipe types, e.g. gibault
  - tension bands
  - solvent cement joints
  - compression ring joints
  - bolted flanges
  - cathodic protection
  - electrofusion
  - butt-welding

Equipment and tools may include:

- hand and power tools
- lifting and winching equipment
- mechanical excavation equipment
- local repair by electronic means, including:

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- top hats
- patches
- pneumatic and motorised equipment, including:
  - compressors
  - pneumatic spades and attachments
  - motorised cutting equipment
  - conventional and jet rodding systems
  - on- and off-road vehicles
  - portable pumps
- communication equipment
- closed circuit television (CCTV) equipment to survey repairs
- breathing apparatus
- gas detection equipment
- rescue equipment
- appropriate personal protective equipment

Legislative and organisational requirements may include:

- relevant federal and state or territory legislation and regulations
- codes of practice, associated standards and guidance material
- documented organisational policies, manuals and induction programs
- relevant community planning and development agreements, such as land care agreements

Unit Sector(s)

Not applicable.

Competency field

Collection and distribution.

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NWP256B Monitor and report water distribution systems

Modification History

NWP256B Release 2: Layout adjusted. No changes to content.
NWP256B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to inspect water distribution systems, detect faults and report on water distribution system performance.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field staff with responsibility for ensuring that water distribution system performance complies with legislative and organisational requirements.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Monitor distribution system performance.	1.1 Conduct ***routine inspections*** of ***supply networks*** and report faults according to organisational procedures.
	1.2 Select ***equipment*** and inspection methods to meet task and site safety requirements.
	1.3 Collect data on system performance and usage and report according to ***legislative and organisational requirements***.
2 Monitor water quality.	2.1 Collect and record water samples according to organisational requirements.
	2.2 Monitor water quality according to organisational requirements.
3 Identify system non-conformance .	3.1 Investigate and report consumer complaints according to organisational requirements.
	3.2 Record and report leakages, and damaged pipes and fittings according to organisational requirements.
	3.3 Identify and report ***system faults*** and operational condition of network according to organisational requirements.
	3.4 Investigate and report pressure and flow fluctuations outside acceptable limits according to organisational requirements.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- identify and respond to operational problems
- produce reports and logs
- use safety and personal protective equipment
- use tools and machinery
- follow plans, instructions and policies
- perform system calculations
- apply inspection and testing procedures and standards
- communicate with employees and customers
- use communication equipment
- give and receive instructions
- work effectively as part of a team
- identify system faults
- use literacy skills in regard to verbal and written communication in the workplace
- identify hazards

Required knowledge:

- system hydraulics basics
- system layout
- system calculations
- environmental aspects of maintenance
- lock-out procedures for mechanical and electrical installations
- relevant utilities and service bodies
- communication systems
- hazardous materials handling
- landscape and ground structure of work area
- risk management principles
- risk factors and potential hazards of inspection processes
- equipment operation, capacity and limitations
- effects of weather and conditions on system operation and plant
- control systems
- pipes and fittings

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to inspect water distribution systems, detect faults and report on water distribution system performance including:

- monitoring and reporting on performance of water distribution systems, including water quality
- identifying and reporting leakages or damage to system components
- identifying and reporting operational conditions falling outside performance specifications
- processing consumer complaints

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency

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demonstrated over a period of time

- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Routine inspections may include:

- interaction and communication with other employees, other authorities and general public
- visual observation
- implementation of reporting procedures that may also include procedures for implementation of by-laws, organisational policies and statutory requirements

Supply networks may include:

- distribution system pipe work, including:
  - polyvinyl chloride (PVC)
  - polyethylene
  - mild steel cement lined
  - ductile iron cement lined
  - cast iron cement lined
  - asbestos cement
  - copper
  - glass reinforced piping
- structures, including:
  - meter pits
  - person access chambers or pits
  - valve chambers
  - regulators
  - erosion barriers
  - head walls
  - thrust blocks
  - pumping stations
  - consumer services
  - meters
- fittings, including:
  - hydrants
  - sluices
  - valves
  - scours
  - main taps
  - jointing systems for pipe types, e.g. gibault
  - tapping bands

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- tension bands
- solvent cement joints
- compression ring joints
- bolted flanges
- electrofusion
- butt welding
- backflow prevention devices
- cathodic protection

Equipment may include:

- hand and power tools
- lifting equipment
- mechanical excavation equipment
- electronic monitoring and metering systems
- recording systems
- motorised equipment
- on- and off-road vehicles
- communication equipment
- breathing apparatus
- gas detection equipment
- rescue equipment
- appropriate personal protective equipment

Legislative and organisational requirements may include:

- relevant federal and state or territory legislation and regulations
- codes of practice, associated standards and guidance material
- documented organisational policies, manuals and induction programs
- relevant community planning and development agreements, such as land care agreements

System faults may include:

- loss of pressure
- leakage
- odour
- turbidity and colour
- loss of flow

Unit Sector(s)

Not applicable.

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Competency field

Collection and distribution.

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NWP257B Maintain and repair wastewater collection systems

Modification History

NWP257B Release 2: Layout adjusted. No changes to content.
NWP257B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to investigate reported problems in wastewater collection systems and to conduct appropriate maintenance and repair work on wastewater collection assets.

Application of the Unit

This unit supports the attainment of skills and knowledge required for field staff with specific responsibility for ensuring that repairs and maintenance of wastewater collection systems are conducted in a safe and timely manner.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Investigate reported system problems.	1.1 Investigate customer complaints. 1.2 Locate problems using inspection points and system fault location techniques. 1.3 Identify organisational and customer responsibilities for faults. 1.4 Select remedial action according to organisational procedures.
2 Plan and prepare for maintenance and repair.	2.1 Determine ***work requirements*** for maintenance and repair of ***assets*** from specifications and instructions. 2.2 Select and check ***equipment and tools*** required to meet task and site safety requirements. 2.3 Select, fit and use personal protective equipment.
3 Maintain and repair assets, pipes and fittings.	3.1 ***Control flows*** to allow maintenance and repair of assets. 3.2 Repair or replace leakages and damaged assets according to organisational procedures. 3.3 Select ***fittings*** and tools and lay or join assets according to manufacturer guidelines and organisational requirements. 3.4 Conduct preventative maintenance according to organisational maintenance programs. 3.5 Locate system chokes and blockages and arrange removal. 3.6 Perform cleaning and flushing according to ***legislative and organisational requirements***. 3.7 Inspect minor structures and determine and apply appropriate repair techniques.
4 Finalise work.	4.1 Check, maintain and store equipment, tools and materials to manufacturer guidelines and organisational procedures. 4.2 Restore work site to meet environmental and organisational requirements.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- identify and respond to operational problems
- produce reports and logs
- use safety and personal protective equipment
- use tools and machinery
- follow plans, charts and instructions
- perform work-related calculations
- apply policies
- apply monitoring procedures and standards
- communicate effectively with employees and customers
- work effectively as part of a team
- use communication systems
- give and receive instructions
- identify system faults
- use literacy skills in regard to verbal and written communication in the workplace
- identify hazards

Required knowledge:

- system hydraulics basics
- system layout
- environmental aspects of maintenance
- customer and organisational responsibilities for blockages
- standards and procedures for organisational repair and maintenance
- lock-out procedures for mechanical and electrical installations
- closed circuit television (CCTV) and other methods of monitoring
- relevant utilities and service bodies
- communication systems
- safety procedures
- hazardous materials handling
- landscape and ground structure of work area
- risk factors and potential hazards of monitoring processes
- equipment operation
- capacity and limitations
- effects of weather and conditions on system operation and plant
- control systems
- pipes and fittings
- disinfection of systems and chemical usage

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to maintain and repair wastewater collection assets by:

- investigating reported faults
- negotiating with customers
- applying organisational procedures to selection of system fault solutions
- preparing equipment, tools and work sites
- conducting maintenance and repair of pipes, fittings and small structures
- reporting blockages
- cleaning and flush systems
- clearing work site
- completing documentation

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect

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and supplementary evidence

- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Work requirements may include:

- location and extent of work
- location of utilities
- site boundary protection and traffic control
- hazards, risks and preventative solutions

Assets may include:

- collection system pipe work, including:
  - polyvinyl chloride (PVC)
  - polyethylene
  - vitrified clay
  - concrete
  - mild steel cement lined
  - ductile iron cement lined
  - cast iron cement lined
  - asbestos cement
  - glass reinforced piping
- structures, including:
  - meter pits
  - maintenance holes, chambers, traps or pits
  - valve chambers
  - regulators
  - erosion barriers
  - thrust blocks
- pumping stations

Equipment and tools may include:

- basic hand and power tools
- electronic monitoring and metering systems
- recording systems
- on- and off-road vehicles
- communication equipment
- computerised equipment
- CCTV
- pipe and cable detection equipment
- leak detection equipment
- motorised equipment
- portable pumps
- communication equipment

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- breathing apparatus
- gas detection equipment
- rescue equipment
- appropriate personal protective equipment

Flow control may include:

- admission of trade waste
- odours
- infiltration and exfiltration
- electronic and manual controlling systems
- pumping systems, including:
  - centrifugal
  - positive displacement
- valving systems, including:
  - sluice
  - gate
  - non-return
  - blade
- metering systems, including:
  - bubbler tube
  - ultrasonic
  - magnetic meter

Fittings may include:

- sluices
- valves
- scours
- main taps
- jointing systems for pipe types, e.g. gibault
- tapping bands
- tension bands
- solvent cement joints
- compression ring joints
- bolted flanges
- electrofusion
- butt welding
- backflow prevention devices
- cathodic protection

Legislative and organisational requirements may include:

- relevant federal and state or territory legislation and regulations
- codes of practice, associated standards and guidance material
- documented organisational policies, manuals and induction programs
- relevant community planning and development

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agreements, such as land care agreements

Unit Sector(s)

Not applicable.

Competency field

Collection and distribution.

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NWP259B Operate, monitor and maintain pump stations

Modification History

NWP259B Release 2: Layout adjusted. No changes to content.
NWP259B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to operate and monitor the performance of pump stations in water and wastewater systems and undertake minor maintenance, or organise more complex maintenance, of pump stations according to organisational operating procedures.

Application of the Unit

This unit supports the attainment of skills and knowledge required for staff with specific responsibility for ensuring that pump stations operate according to organisational requirements. This may include minor maintenance tasks, such as gland adjustment, packing replacement and the replacement of some fittings.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare work.	1.1 Determine ***pump station work requirements*** from standard operating and maintenance procedures. 1.2 Access and interpret ***pump operation and maintenance procedures***. 1.3 Perform site check to prevent damage to other utilities and the environment, according to ***legislative and organisational requirements***. 1.4 Select and check ***equipment*** to meet safety requirements of task and site and select, fit and use personal protective equipment. 1.5 Handle, use and store ***chemicals*** according to organisational requirements.
2 Operate pump stations.	2.1 Identify and set or adjust ***pump station components*** according to organisational requirements. 2.2 Carry out routine security inspections and cleaning duties. 2.3 Operate pump station according to organisational requirements.
3 Maintain pump stations.	3.1 Apply ***pump station maintenance standards***. 3.2 Inspect pump station components according to organisational requirements, and identify ***maintenance needs***. 3.3 Schedule maintenance tasks and order appropriate ***materials***. 3.4 Conduct maintenance tasks according to organisational maintenance standards and manufacturer recommendations. 3.5 Identify and report ***pump station faults*** and carry out minor repairs.
4 Monitor and adjust pump station performance.	4.1 Apply pump station performance targets. 4.2 Identify and apply ***monitoring points and timing***. 4.3 Monitor pump station and make ***adjustments***, where necessary, to maintain operational parameters.
5 Check outsourced maintenance work.	5.1 Check that completed maintenance and repairs meet specifications. 5.2 Check return of pumping station to service.
6 Finalise work.	6.1 Check, maintain and store equipment, tools and materials according to manufacturer guidelines and organisational procedures. 6.2 Restore work site to meet environmental and organisational requirements. 6.3 Maintain workplace records as required.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- operate pumps and pumping stations
- maintain pumps and pumping stations
- identify system faults
- identify hazards
- implement remedial action
- operate service according to procedures
- identify and respond to operational problems
- collect data
- produce reports and logs
- use safety and personal protective equipment
- use tools and machinery
- follow plans and instructions
- perform work-related calculations
- apply procedures and standards
- communicate with employees and customers
- work effectively as part of a team
- use communication systems
- use literacy skills in regard to verbal and written communication in the workplace
- give and receive instructions

Required knowledge:

- system hydraulics basics, including suction and lift
- system layout
- principles and purpose of pump operation
- OHS requirements
- types of pump and their operational function
- pump and pump station operation and maintenance procedures and standards
- principles affecting selection of pump station monitoring points and timing of monitoring activities
- environmental aspects of operation
- lock-out procedures for mechanical and electrical installations
- relevant utilities and service bodies
- communication systems
- hazardous materials handling
- risk factors and potential hazards of operating wastewater transfer systems
- equipment operation, capacity and limitations
- effects of weather and conditions on system
- control systems

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- pump station components
- high and low voltage requirements
- effect of lightning strikes

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability tooperate and monitor the performance of pump stations in water and wastewater systems and undertake minor maintenance including:

- planning and preparing for work, including selecting equipment and chemicals
- operating pump stations, including conducting a security inspection
- conducting pump station maintenance
- monitoring and adjusting pump station performance
- checking quality of outsourced maintenance work
- finalising work, including completing documentation

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence

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- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

Questioning will be appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Pump station work requirements may include:

- location
- timing
- site boundary protection
- type of pumps
- extent of maintenance
- maintenance methods

Pump operation and maintenance procedures may include:

- gland packing
- gland adjustment
- removal and replacement of valves or instruments

Legislative and organisational requirements may include:

- relevant federal and state or territory legislation and regulations
- codes of practice, associated standards and guidance material
- documented organisational policies, manuals and induction programs
- relevant community planning and development agreements, such as land care agreements

Equipment used may include:

- hand and power tools
- high pressure cleaning equipment
- lifting equipment
- on- and off-road vehicles
- portable pumps
- communication equipment
- breathing apparatus
- gas detection equipment
- rescue equipment
- appropriate personal protective equipment

Chemicals may include:

- cleaning chemicals
- oils
- greases
- paints
- thinners

Pump station components may include:

- suction pipes
- valves
- pumps

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	• electrical cabinets • pumps • weirs • flow meters • run time meters • wet and dry pump wells • electrical motors
Pump station maintenance standards may include:	• electrical • mechanical • civil construction
Maintenance needs may include:	• painting • adjusting glands • replacing corroded items, such as bolts • cleaning • removing fat and solids build up.
Materials may include:	• metal • masonry • wood
Pump station faults may include:	• flow fluctuations outside acceptable limits • over-heating bearing • blocked suction lines • vibrating drive shaft • broken impellers
Monitoring points and timing may include:	• routine inspections of flow rate • inspections to identify infiltration and obstructions
Adjustments may include:	• flow • use of night and day rate power

Unit Sector(s)

Not applicable.

Competency field

Collection and distribution.

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NWP260A Monitor and report water treatment processes

Modification History

NWP260A Release 2: Layout adjusted. No changes to content.
NWP260A Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to monitor and report on water treatment processes within potable community and industrial water treatment plants in urban and rural areas.

Application of the Unit

This unit supports the attainment of skills and knowledge required for operational staff in water treatment plants with responsibility for monitoring and reporting on water treatment processes.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Identify characteristics of water purity and reasons for treatment of potable water.	1.1 Identify characteristics of water affecting its physical, chemical and microbiological acceptability. 1.2 Identify ***reasons and requirements*** for treatment of water.
2 Monitor and report on water quality.	2.1 Clearly identify water treatment ***processes*** and determine their application. 2.2 Identify organisation's water quality parameters and check characteristics of ***water quality*** according to relevant legislation and organisational procedures. 2.3 Record and report water quality according to organisational procedures.
3 Follow safety requirements for work in a water treatment plant.	3.1 Identify and record hazards of working in a water treatment plant. 3.2 Identify and record operational requirements for safe and effective use of ***equipment***. 3.3 Select, fit and use safety equipment, including personal protective equipment.
4 Monitor and report on water treatment.	4.1 Identify operating principles used in water treatment processes. 4.2 Complete records required for effective operation of a water treatment plant. 4.3 Identify, record and report range of data routinely collected. 4.4 Identify data that falls outside normal operating range and report for further action.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- apply policies, procedures and standards
- recognise and report operational problems
- use safety equipment and personal protective equipment
- select, collect and test samples
- interpret material safety data sheets (MSDS)
- receive and apply instructions
- use literacy skills in regard to verbal and written communication in the workplace
- communicate with other employees and people that interact within the work environment

Required knowledge:

- operating principles of water treatment processes
- basic water chemistry
- water uses and demands, both domestic and industrial
- physical, chemical and microbiological characteristics of water within the water treatment process
- water quality guidelines
- reasons for water treatment
- types of treatment plants and processes
- major chemicals and equipment used
- physical and chemical hazards
- reasons for data and information collection

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to monitor and report on water treatment processes within potable community and industrial water treatment plants in urban and rural areas including:

- identifying characteristics and importance of water quality
- establishing organisational water quality standards
- checking and recording water quality characteristics
- applying safety procedures in a potable water treatment plant
- collecting and recording routine data on water treatment plant processes

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence

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- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Reasons and requirements for water treatment include:

- ensuring conformity with standards and guidelines, including Australian Drinking Water Guidelines
- removal of impurities, contaminants and pollution
- impact of impurities on water treatment processes
- relevant water and environment legislation and regulations
- hazard analysis critical control point (HACCP) operational philosophy

Water treatment ***processes*** may include:

- screens
- coagulation and flocculation
- sedimentation clarification
- dissolved air flotation
- granular and membrane filtration
- disinfection
- aeration and oxidation
- fluoridation
- reverse osmosis
- ion exchange
- activated carbon adsorption
- calibration of dosing equipment
- softening
- backwash water treatment

Water quality characteristics may include:

- physical
- chemical
- microbiological

Equipment used may include:

- pumps, including:
  - centrifugal
  - positive displacement
  - airlift
- blowers and compressors
- mixers and chemical batching facilities
- control valves
- electronic digital monitoring systems
- recording systems
- chemical testing and analysis equipment

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- communication equipment
- manual or hydraulic equipment
- personal protective equipment

Unit Sector(s)

Not applicable.

Competency field

Treatment.

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NWP261A Operate and maintain water treatment plant and equipment

Modification History

NWP261A Release 2: Layout adjusted. No changes to content.
NWP261A Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to operate water treatment processes within potable community and industrial water treatment plants in urban and rural areas. The ability to operate water treatment processes in compliance with relevant water legislation and regulations, and Australian Drinking Water Guidelines is vital to performance.

Application of the Unit

This unit supports the attainment of skills and knowledge required for operational staff in water treatment plants with responsibility for the practical and safe operation of plant, equipment and processes.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Operate water treatment processes.	1.1 Identify ***reasons and requirements*** for treatment of water. 1.2 Identify major components of ***water treatment processes***. 1.3 Identify and apply practices undertaken in water treatment processes. 1.4 Operate ***mechanical equipment*** used in water treatment according to manufacturer specifications and organisational requirements. 1.5 Handle, use, store and dose ***chemicals*** according to organisational procedures.
2 Maintain items of equipment used in water treatment processes.	2.1 Identify maintenance requirements and schedules according to standard operating procedures. 2.2 Complete maintenance and cleaning requirements of equipment.
3 Follow safety requirements for work in a water treatment plant.	3.1 Identify and record hazards of working in a water treatment plant. 3.2 Identify and record operational requirements for the safe and effective use of equipment. 3.3 Select, fit and use safety equipment, including personal protective equipment. 3.4 Identify and apply safe work practices when handling chemicals and working in a water treatment plant.
4 Complete documentation.	4.1 Complete records required for effective operation of a water treatment plant according to organisational requirements. 4.2 Identify and record range of data routinely collected. 4.3 Identify data that falls outside normal operating parameters and report for further action.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- apply policies, procedures and standards
- recognise and report operational problems
- use safety equipment and personal protective equipment
- collect and test samples
- interpret material safety data sheets (MSDS)
- receive and apply instructions
- use literacy skills in regard to verbal and written communication in the workplace
- communicate with other employees and people that interact within work environment

Required knowledge:

- water cycle
- sources of water
- uses of water, both domestic and industrial
- physical, chemical and microbiological characteristics of water within the water treatment process
- water quality characteristics
- reasons for water treatment
- types of treatment plants and processes
- major chemicals and equipment used
- water treatment plant hazards
- safety equipment
- reasons for data and information collection

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to operate water treatment processes within potable community and industrial water treatment plants in urban and rural areas including:

- applying water treatment processes, including operating mechanical equipment
- using chemicals safely and according to organisational procedures
- conducting regular routine inspection of mechanical equipment
- identifying hazards and applying appropriate safety procedures
- gathering and recording data
- reporting anomalies

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning

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experience must include a combination of direct, indirect and supplementary evidence

- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Reasons and requirements for treatment include:

- ensuring conformity with standards and guidelines, including Australian Drinking Water Guidelines
- removal of impurities, contaminants and pollution
- impact of impurities on water treatment processes
- relevant water legislation and regulations relating to water and the environment
- hazard analysis critical control point (HACCP) operational philosophy

Water treatment processes may include:

- screens
- coagulation and flocculation
- sedimentation clarification
- dissolved air flotation
- granular and membrane filtration
- disinfection
- aeration and oxidation
- fluoridation
- reverse osmosis
- ion exchange
- activated carbon adsorption
- calibration of dosing equipment
- softening
- backwash water treatment

Mechanical equipment may include:

- pumps, including:
  - centrifugal
  - positive displacement
  - airlift
- blowers and compressors
- mixers and chemical batching facilities
- control valves
- electronic digital monitoring systems
- recording systems
- chemical testing and analysis equipment
- communication equipment
- flow meters
- alarms and process control systems

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	• centrifuge • belt filter press • screens, including raked bar screens • manual or hydraulic equipment
Chemicals and aids used may include:	• lime • soda ash • aluminium and iron coagulants • polymers • chlorine • fluoride • carbon dioxide

Unit Sector(s)

Not applicable.

Competency field

Treatment.

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NWP262A Monitor and report wastewater treatment processes

Modification History

NWP262A Release 2: Layout adjusted. No changes to content.
NWP262A Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to monitor and report on wastewater treatment processes within domestic and industrial wastewater treatment plants in urban and rural areas. The ability to monitor processes to ensure that wastewater disposal or re-use meets state or territory licensing requirements is essential to performance.

Application of the Unit

This unit supports the attainment of skills and knowledge required for operational staff in wastewater treatment plants with responsibility for monitoring wastewater treatment processes.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Identify sources and characteristics of wastewater and reasons for wastewater treatment.	1.1 Identify ***wastewater sources*** and characteristics. 1.2 Identify ***reasons*** and ***statutory requirements*** for wastewater treatment.
2 Monitor and report on wastewater quality.	2.1 Identify ***wastewater treatment processes*** and determine their application. 2.2 Check ***characteristics of wastewater*** according to organisational procedures. 2.3 Record and report wastewater quality according to organisational procedures.
3 Follow safety requirements for work in a wastewater treatment plant.	3.1 Identify and record hazards of working in a wastewater treatment plant. 3.2 Identify operational requirements for safe and effective use of ***equipment***. 3.3 Select, fit and use safety equipment, including personal protective equipment. 3.4 Identify and apply safe work practices when handling ***chemicals*** and working in a wastewater treatment plant.
4 Monitor and report on wastewater treatment.	4.1 Identify operating principles used in wastewater treatment processes. 4.2 Complete records required for effective operation of a wastewater treatment plant. 4.3 Identify, record and report range of ***data*** routinely collected. 4.4 Carry out, record and report ***process calculations***. 4.5 Identify data that falls outside normal operating ***parameters*** and report for further action.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- apply policies, procedures and standards
- recognise and report operational problems
- use safety equipment and personal protective equipment
- select, collect and test samples
- interpret material safety data sheets (MSDS)
- receive and apply instructions
- use literacy skills in regard to verbal and written communication in the workplace
- communicate with other employees and people that interact within the work environment

Required knowledge:

- sources of wastewater
- physical, chemical and microbiological characteristics and operating principles related to wastewater treatment
- reasons for wastewater treatment
- types of wastewater treatment plant processes
- major chemicals and equipment used
- wastewater treatment plant hazards
- safety equipment
- reasons for data and information collection

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability tomonitor and report on wastewater treatment processes within domestic and industrial wastewater treatment plants in urban and rural areas including:

- performing, recording and reporting process measurements and calculations
- demonstrating procedures for starting and stopping plant and locking out control equipment
- adjusting process controls according to specific plant procedures
- recording and reporting faults and breakdowns
- identifying common process faults and following procedures to rectify these

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect

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and supplementary evidence

- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Wastewater sources may include:	• domestic • industrial • storm • ground
Reasons for treatment may include:	• ensuring conformity with legislation, regulations, standards and codes • removal of impurities and contaminants to enable discharge or re-use • reducing impact of impurities on the environment and public health
Statutory requirements are defined by:	• relevant federal and state or territory legislation and regulations • codes of practice, associated standards and guidance material • documented organisational policies, manuals and induction programs • relevant community planning and development agreements, such as land care agreements
Wastewater treatment processes may include:	• grit removal • aeration • screening • sedimentation • disinfection • granular and membrane filtration • thickening and dewatering • suspended and fixed media aerobic bioreactor processes • anaerobic processes • lagoons and wetlands • gas scrubbers • biosolids and effluent disposal and re-use • dilution • chemical dosing • nutrient removal • reverse osmosis
Characteristics of	• types of impurities, such as: • organic

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wastewater may include:

- inorganic
- micro-organisms
- public health considerations

Equipment used may include:

- pumps, including:
  - centrifugal
  - positive displacement
  - airlift
- blowers
- screens
- control valves
- electronic digital monitoring systems
- recording systems
- chemical testing and analysis equipment
- communication equipment
- belt press
- centrifuge
- comminutor
- flow meters
- flow recorders
- manual or hydraulic equipment
- personal protective equipment

Chemicals and major equipment used may include:

- chemicals and lime
- sodium hypochlorite
- aluminium and iron coagulants
- polymers

Data may include:

- instantaneous flow rate
- flow records
- temperature
- sand and grit
- pH
- chemical oxygen demand
- dissolved oxygen
- settleable solids concentration (cone test)
- thirty minute settleability test
- sludge blanket level
- residual chlorine
- microscopic examination
- conductivity

Process calculations may include:

- average dry weather flow
- peak dry weather flow
- chemical feed rate and concentration

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Wastewater quality ***parameters*** may include:	• process efficiency • physical • chemical • microbiological

Unit Sector(s)

Not applicable.

Competency field

Treatment.

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NWP263A Operate and maintain wastewater treatment plant and equipment

Modification History

NWP263A Release 2: Layout adjusted. No changes to content.
NWP263A Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to operate and maintain wastewater treatment processes within domestic and industrial wastewater treatment plants in urban and rural areas. The ability to operate wastewater treatment processes to ensure that wastewater disposal or re-use meets state or territory licensing requirements is essential to performance.

Application of the Unit

This unit supports the attainment of skills and knowledge required for operational staff in wastewater treatment plants with responsibility for the practical and safe operation of plant, equipment and processes.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Operate wastewater treatment processes.	1.1 Identify ***reasons and requirements*** for treatment of wastewater. 1.2 Identify major components of wastewater treatment processes. 1.3 Identify and apply practices undertaken in ***wastewater treatment processes***. 1.4 Operate ***mechanical equipment*** used in wastewater treatment according to manufacturer specifications and organisational requirements. 1.5 Handle, use, store and dose ***chemicals*** according to relevant legislation and organisational procedures.
2 Maintain items of equipment used in wastewater treatment processes.	2.1 Identify maintenance requirements and schedules according to standard operating procedures. 2.2 Meet maintenance and cleaning requirements of equipment.
3 Follow safety requirements for work in a wastewater treatment plant.	3.1 Identify and record hazards of working in a wastewater treatment plant. 3.2 Identify and record operational requirements for safe and effective use of equipment. 3.3 Select, fit and use safety equipment, including personal protective equipment. 3.4 Identify and apply safe work practices when handling chemicals and working in a wastewater treatment plant.
4 Record wastewater treatment plant data.	4.1 Complete records required for effective operation of a wastewater treatment plant. 4.2 Identify, record and report range of data routinely collected. 4.3 Identify data that falls outside normal operating parameters and report for further action.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- recognise and report operational problems
- apply policies, procedures and standards
- use safety equipment and personal protective equipment
- collect and test samples
- interpret material safety data sheets (MSDS)
- receive and apply instructions
- use literacy skills in regard to verbal and written communication in the workplace
- communicate with other employees and people that interact within the work environment

Required knowledge:

- sources and characteristics of wastewater
- physical, chemical and microbiological characteristics and basic principles related to wastewater treatment
- reasons for wastewater treatment
- types of wastewater treatment plants and processes
- major chemical types and equipment used
- wastewater treatment plant hazards
- safety equipment
- reasons for data and information collection
- MSDS

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability tooperate and maintain wastewater treatment processes within domestic and industrial wastewater treatment plants in urban and rural areas including:

- applying wastewater treatment processes, including operating mechanical equipment
- using chemicals safely, as required and according to organisational procedures
- conducting regular routine inspection of mechanical equipment
- identifying hazards and applying appropriate safety procedures
- gathering and recording data
- reporting anomalies

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning

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experience must include a combination of direct, indirect and supplementary evidence

- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Reasons and requirements for treatment may include:

- ensuring conformity with legislation, standards and guidelines
- removing impurities and contaminants to enable discharge and re-use
- reducing impact of impurities on environment and public health
- relevant environmental protection legislation and regulations and trade waste agreements

Wastewater treatment processes may include:

- grit removal
- aeration
- screening
- sedimentation
- disinfection
- granular and membrane filtration
- thickening and dewatering
- anoxic processes
- sludge digestion
- suspended and fixed media aerobic bioreactor processes
- anaerobic processes
- lagoons and wetlands
- gas scrubbers
- biosolids and effluent disposal and re-use
- dilution
- chemical dosing
- nutrient removal
- reverse osmosis

Mechanical equipment used may include:

- pumps, including:
  - centrifugal
  - positive displacement
  - airlift
- blowers
- screens
- control valves
- electronic digital monitoring systems
- recording systems

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	• chemical testing and analysis equipment • communication equipment • manual and hydraulic equipment • personal protective equipment
Chemicals and aids used may include:	• lime • sodium hypochlorite • polymers • aluminium and iron coagulants • carbon sources

Unit Sector(s)

Not applicable.

Competency field

Treatment.

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NWP268B Monitor, operate and report chlorine disinfection systems

Modification History

NWP268B Release 2: Layout adjusted. No changes to content.
NWP268B Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to monitor and operate chlorine disinfection systems and to report on process quality control.

Application of the Unit

This unit supports the attainment of skills and knowledge required for operational staff with specific responsibility for ensuring that chlorine disinfection systems comply with organisational requirements. For staff working on chlorine disinfection systems where liquefied chlorine gas is used, the unit NWP277A Work safely with liquefied chlorine gas, is essential.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare for work.	1.1 Determine work requirements according to ***legislative and organisational requirements***.
	1.2 Select and check ***equipment*** required to meet safety requirements of task and site.
	1.3 Select, fit and use personal protective equipment.
2 Monitor systems performance.	2.1 Monitor chlorine ***disinfection systems*** according to agreed schedule and procedures.
	2.2 Collect process samples and conduct standard ***tests***.
	2.3 Maintain and monitor relevant OHS requirements.
	2.4 Collect and report process data according to organisational and disinfection system requirements.
	2.5 Make system adjustments as required to maintain effectiveness of chlorine disinfection.
3 Prepare and apply chemical dosing.	3.1 Handle, use and store ***chemicals*** according to environmental and organisational requirements.
	3.2 Prepare chemical dosing according to system specifications and organisational requirements and apply using appropriate ***chlorine dosing equipment***.
	3.3 Maintain information related to chlorine supply and usage according to statutory requirements.
4 Complete documentation.	4.1 Compile records from plant and system data to meet organisational requirements.
	4.2 Report observations outside defined parameters for further action.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- identify and respond to operational and process faults with chlorine dosing equipment problems
- produce reports and logs
- use safety and personal protective equipment
- follow plans, charts and instructions
- apply policies, standard operating procedures and regulatory standards
- collect and test samples
- communicate with employees and customers
- work effectively as part of a team
- use communication equipment
- give and receive instructions
- perform work-related calculations
- prepare and apply chlorine dosing
- operate computerised equipment
- identify control system faults
- identify hazards
- perform microbiological and chlorine residual sampling
- use literacy skills in regard to verbal and written communication in the workplace
- interpret material safety data sheets (MSDS)

Required knowledge:

- properties and chemistry of chlorine
- pH
- microbiological water quality guidelines
- chlorine system layout
- lock-out procedures for mechanical and electrical installations
- policies, standard operating procedures and legislation
- communication systems
- hazardous substances handling
- risk factors and potential hazards associated with chlorination
- work-related chlorine calculations
- chlorine dosing processes
- equipment operation, capacity and limitations
- pumping and valving systems
- automatic feed rate control systems
- MSDS

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to monitor, operate and report on chlorine disinfection systems by:

- scheduling work
- selecting and using appropriate tools and equipment, including personal protective equipment
- monitoring chlorine disinfection systems
- collecting process samples and performing standard tests
- collecting and reporting process data
- preparing and applying chlorine dosing safely
- producing reports

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be

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authenticated and show that it represents competency demonstrated over a period of time

- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Legislative and organisational requirements may include:	• relevant federal and state or territory legislation and regulations • codes of practice, associated standards and guidance material • documented organisational policies, manuals and induction programs • relevant community planning and development agreements, such as land care agreements
Equipment may include:	• electronic monitoring and metering systems • recording systems • basic hand and power tools • sampling and laboratory testing equipment • computerised equipment • on- and off-road vehicles • communication equipment • personal protective equipment
Disinfection systems may include:	• liquefied chlorine gas • sodium hypochlorite • calcium hypochlorite
Tests may include:	• chlorine residuals • pH

Chemicals may include:	• liquefied chlorine gas
	• sodium hypochlorite
	• calcium hypochlorite
	• pH correcting chemicals, such as:
	  • sodium hydroxide
	  • lime
	  • soda ash

Chlorine dosing equipment may include:	• vacuum gas or liquid chlorinator • hypochlorite dosing pump • calcium hypochlorite tablet dispenser

Unit Sector(s)

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Not applicable.

Competency field

Treatment.

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NWP276A Monitor, operate and report fluoridation processes

Modification History

NWP276A Release 2: Layout adjusted. No changes to content.
NWP276A Release 1: Primary release.

Unit Descriptor

This unit of competency describes the outcomes required to monitor and operate fluoridation processes and to report on water quality control.

Application of the Unit

This unit is a skill set required by water operators responsible for fluoridation processes in water treatment. It may be a requirement for compliance with state and territory legislation and government water quality guidelines.
This unit of competency is a skills set for operators responsible for fluoridation processes in water treatment.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare for work.	1.1 Determine work requirements according to ***organisational requirements*** and health and safety requirements. 1.2 Select and check ***equipment and tools*** required to meet safety requirements of task and site. 1.3 Select, fit and use ***personal protective equipment***.
2 Monitor process performance.	2.1 Monitor ***fluoridation processes*** according to agreed schedule and procedures. 2.2 Collect process samples and conduct standard ***tests***. 2.3 Maintain and monitor relevant OHS requirements. 2.4 Collect ***process data***, perform ***calculations*** and report according to organisational and fluoridation process requirements.
3 Prepare and apply fluoride dosing.	3.1 Handle, use and store ***fluoridation chemicals*** according to organisational requirements. 3.2 Apply fluoride dosing and perform calculations according to organisational requirements.
4 Report on fluoridation processes.	4.1 Maintain information related to fluoride supply and usage according to organisational requirements. 4.2 Produce information relating to maintenance and operation according to organisational requirements. 4.3 Record information and submit according to organisational procedures for continuous improvement and incident management.

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- identify and respond to operational problems
- produce reports and logs
- use safety and personal protective equipment
- follow plans, charts and instructions
- apply policies, regulatory standards and standard operating procedures relevant to fluoridation
- communicate effectively with colleagues to determine work requirements and report information using clear and direct communication appropriate for the audience and context
- work effectively as part of a team
- use organisation's communication equipment
- receive, clarify and confirm work instructions
- perform chemical dosing calculations
- prepare and apply fluoride dosing
- identify and report control system faults
- identify and report hazards
- perform fluoride residual sampling and testing
- use literacy skills to produce reports and logs and interpret a range of workplace documents
- interpret and follow material safety data sheets (MSDS)

Required knowledge:

- properties of fluoridation chemicals
- fluoridation and its relationship to public health
- fluoride sampling and record keeping
- fluoride addition points
- fluoride system layout and security
- lock-out procedures for mechanical and electrical installations
- policies and standard operating procedures for fluoride processes
- organisation's communication systems and procedures
- safe handling and disposal of fluoride compounds
- risk factors and potential hazards associated with fluoridation
- work-related fluoride calculations
- fluoride dosing processes
- equipment operation, capacity and limitations
- effects of weather and conditions on operation of site or plant
- pumping and valving systems
- automatic feed rate control systems

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- MSDS

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to monitor, operate and report on fluoridation processes by:

- scheduling work
- selecting and using appropriate tools and equipment, including personal protective equipment
- calculating average fluoride concentrations
- collecting process samples and determining fluoride residuals
- collecting and reporting process data
- preparing and applying fluoride dosing safely
- completing log sheets

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition

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(RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time

- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

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Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Organisational requirements may include:

- codes of practice, associated standards and guidance material for the handling and control of fluoride processes
- organisational policies, manuals and induction programs
- occupational health and safety requirements

Equipment and tools may include:

- electronic monitoring and metering systems
- recording systems
- basic hand and power tools
- sampling and laboratory testing equipment
- computerised equipment
- off-road vehicles, such as forklift trucks
- organisation's communication equipment

Personal protective equipment may include:

- that specified in MSDS
- impervious rubber or plastic suits
- elbow-length gloves, apron and boots with long-sleeved shirt and long trousers
- for plants using dry fluoridating agents:
  - full face mask with type 3 respiratory filter or chemical goggles and a half mask with P3 type respiratory filter (AS/NZS 1715 Selection, Use and Maintenance of Respiratory Protective Devices)
- for plants using liquid fluoridising agents:
  - full face shield or splash-proof safety goggles

Fluoridation processes may include:

- solution feed such as:
  - sodium fluoride solution feed
  - sodium fluoride saturator system
- dry chemical feeders, such as sodium fluorosilicate
- acid feed systems

Tests may include:

- fluoride residual analysis
- ion selective electrodes
- spectrophotometry/colorimetry, such as SPADNS method

Process data may include:

- volume of water treated
- quantity of fluoride added to the water
- stock fluoride on hand
- results of fluoride residual analyses

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Calculations may include:	• calculated average fluoride concentrations • average fluoride dosage or concentration • chemical dosing rate, given required fluoride dosage • fluoride dosage, given chemical dosing rate
Fluoridation chemicals may include:	• sodium fluoride • sodium fluorosilicate • fluorosilicic acid

Unit Sector(s)

Not applicable.

Competency field

Treatment.

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PMASUP410B Develop plant documentation

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the development, establishment and evaluation of plant documentation in response to identified information requirements including the development of workplace documents for the introduction of new systems, processes, equipment and record keeping requirements. The competency unit applies to a wide range of plant documentation. This unit does not apply to the participation in reviewing workplace documentation, which is covered by *MSAPMSUP210A Process and record information*.

Application of the Unit

Application of the unit	Typically, the employee would: • investigate the need for new plant documentation • determine operating principles and best practice in consultation with others • draft plant documentation • validate and modify plant documentation in response to feedback • communicate changes and amendments.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		

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Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify information need/deficiency.	1.1. Identify the need for documentation in accordance with company requirements 1.2. Evaluate current documentation where existent 1.3. Define information need/deficiency 1.4. Discuss information requirements with appropriate personnel.
2. Develop plant documentation.	2.1. Specify information need and set/prioritise objectives 2.2. Analyse existing documentation/records in accordance with specified requirements 2.3. Determine operating principles and best practice where required 2.4. Develop/amend documentation as a draft in accordance with specifications to standard format 2.5. Issue documentation to appropriate personnel for review 2.6. Edit documentation and amend in accordance with review requirements 2.7. Complete documentation to satisfy the initial identified need/deficiency.
3. Communicate changes to plant documentation.	3.1. Explain and communicate documentation to all relevant personnel 3.2. Distribute documentation to all appropriate personnel 3.3. Evaluate implementation of documentation 3.4. Amend documents if required.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This describes the essential skills and knowledge and their level, required for this unit.
Required skills
Competence, sufficient to be able to develop and amend work place documentation, includes the ability to apply and explain: • enterprise information systems and work place documentation • enterprise quality and safety procedures • principles of policy and procedure development • principles of information/data management • importance of effective consultation in developing documentation • relevant equipment and operational processes.
Required knowledge
The knowledge referred to in the Evidence Guide for this unit includes: • organisation policies, standard procedures and work instructions and relevant regulatory requirements for the development of plant documentation • standard codes of practice relevant to developing plant documentation.

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Evidence Guide

EVIDENCE GUIDE
The Evidence Guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for the Training Package.

Overview of assessment	Assessment of this unit should include demonstrated competence on actual plant and equipment in a work environment. The unit will be assessed in as holistic a manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations which will include disruptions to normal, smooth operation. Assessment will typically use a plant documentation development project. This unit of competency requires a significant body of knowledge which will be assessed through questioning and the use of what-if scenarios both on the plant (during demonstration of normal operations and walk-throughs of abnormal operations) and off the plant.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of satisfactory performance in this unit can be obtained by observation of performance and questioning to indicate understanding and knowledge of the Elements of the competency and Performance Criteria. Consistent performance should be demonstrated. In particular look to see that: • effective maintenance and evaluation of workplace documentation is carried out • effective research and consultation is undertaken to ensure the development of best practice documentation • feedback is provided on how to improve workplace documentation • completed documentation is user friendly, accurate and in accordance with the intended use/requirements • adequate documentation is produced, including documentation for the introduction of new systems, policies, equipment or processes

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EVIDENCE GUIDE	
	• non routine problems in relation to plant documentation are recognised and appropriate solutions are presented • changes to workplace documentation is communicated in the appropriate manner. These aspects may be best assessed using a range of scenarios/case studies/what-ifs as the stimulus with a walk-through forming part of the response. These assessment activities should include a range of problems, including new, unusual and improbable situations which may have been generated from the past incident history of the plant, incidents on similar plants around the world, hazard analysis activities and similar sources.
Context of and specific resources for assessment	Assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability over a range of situations. A bank of scenarios/case studies/what-ifs will be required as will a bank of questions which will be used to probe the reasoning behind the observable actions.
Method of assessment	In all plants it may be appropriate to assess this unit concurrently with relevant teamwork units.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

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Range Statement

RANGE STATEMENT	
The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the Performance Criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs if the candidate, accessibility of the item, and local industry and regional contexts.	
Codes of practice/ standards	Where reference is made to industry codes of practice, and/or Australian/international standards, the latest version must be used.
Context	This competency is typically performed by experienced operators, team leaders or supervisors who may be working individually or in a team environment.
Documentation	This competency includes the following indicative plant documentation: • operating procedures • work instructions • incident procedures • operating manuals • quality manuals and procedures • training program contents/materials • safety data sheets • job cards • maintenance logs • non-compliance reports • incidence and accident reports • permits • schematics/process flows/engineering drawings.
Information	Sources of information may include: • manufacturing specifications • product specifications • company policies and procedures • customer requirements • industry/work place codes of practice • State/industry OHS legislation and regulations • ISO and other industry standards and regulations • industry associations, networks and professional bodies.
Equipment	Items of equipment for this competency include: • computer equipment.

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RANGE STATEMENT	
Procedures	Procedures may be written, verbal, computer-based or in some other form. They include: • all work instructions • standard operating procedures • formulas/recipes • batch sheets • temporary instructions • any similar instructions provided for the smooth running of the plant. For the purposes of this Training Package, 'procedures' also includes good operating practice as may be defined by industry codes of practice (eg Responsible Care) and government regulations.
Health, safety and environment (HSE)	All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence.

Unit Sector(s)

Unit sector	Support/generic

Competency field

Competency field	

Co-requisite units

Co-requisite units		

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RIIRAI609D Establish and maintain electrical installations, reticulation and protection system

Modification History

Not applicable.

Application

This unit develops a participant's skills and knowledge required to establish and maintain electrical installations, reticulation and protection systems in Coal mining.
This unit is appropriate for those working in management or technical specialist roles.
No licensing, legislative or certification requirements apply to this unit at the time of publication

Unit Sector

Coal mining

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Elements and Performance Criteria

1. Plan and prepare for electrical installations, reticulation and protection	1.1 Access, interpret and apply electrical installations, reticulation and protection system documentation and ensure the work activity is compliant 1.2 Obtain, read, interpret, clarify and confirm work requirements 1.3 Identify and address potential risks, hazards and environmental issues and implement control measures 1.4 Select and wear personal protective equipment appropriate for work activities 1.5 Identify design/selection specifications and critical aspects of the systems from a comprehensive analysis of operating requirements 1.6 Identify systems options from an analysis of all relevant technical, operational and financial information 1.7 Select the preferred systems options on the basis of performance against specification requirements
2. Provide power supply systems for the mine site	2.1 Install, maintain, review and modify mine power supply systems 2.2 Undertake processes and procedures and ensure reliability and quality of supply taking into account transients, harmonics, over-voltages, voltage regulation, lightning and stray currents 2.3 Plan and install alternative power supply associated with mine site conditions and safety needs 2.4 Undertake processes and procedures to protect high energy sources (sub stations and transformers) through the selection and installation of switchgear and protective devices 2.5 Provide mine illumination systems and equipment 2.6 Plan and install battery and associated charging equipment 2.7 Review, audit, report and maintain all power supply systems
3. Provide electrical protection system for mine sites	3.1 Access, interpret and apply the compliance documentation requirements related to mine electrical protection system 3.2 Install and maintain the electrical protection system 3.3 Identify, isolate, rectify faults in electrical installations and verify ability of the system through recognised decision-making processes, including the use of fault level calculations, discrimination and component ratings 3.4 Apply management decision-making processes for the maintenance, examination and testing of electrical protection systems relative to mine site and safety needs

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	3.5 Review, modify, audit and maintain all electrical protection systems and devices
4. Provide cables from power source to point of usage	4.1 Access, interpret, apply and implement the compliance documentation requirements related to provision and use of mine cables 4.2 Identify, select and install mine cables 4.3 Identify, report and rectify mine cable faults and hazards in accordance with mine site and hazard control requirements 4.4 Inspect mine cables for their integrity, usage, consequence of fault/damage and previous repairs 4.5 Carry out management, inspection, application, testing, fault finding and repair
5. Provide mobile machinery and electrical apparatus	5.1 Access, interpret, clarify and apply the compliance documentation requirements related to provision and use of mobile machinery and electrical apparatus 5.2 Identify, select and install mobile machinery and electrical apparatus 5.3 Inspect, monitor, report and rectify mobile machinery and electrical apparatus faults and hazards 5.4 Carry out testing
6. Provide overall electrical services that apply to production systems	6.1 Access, interpret, clarify and apply the compliance documentation requirements related to overall electrical services that apply to production systems 6.2 Select, install, monitor and maintain mine communication systems 6.3 Select, install, monitor, modify and maintain the electrical components of the gas monitoring and detection systems 6.4 Select, install, monitor, modify and maintain control systems 6.5 Control, monitor and rectify electromagnetic interference that may affect the safe use of electrical systems and other mining equipment 6.6 Select, install, monitor, modify and maintain remote control systems on mining equipment 6.7 Select, install, monitor, modify and maintain welding equipment and energy delivery sources, including pre and post operations 6.8 Identify, control and manage hazards from electrostatic charges

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7. Provide safe electrical work procedures	7.1 Access, interpret, clarify and implement the compliance documentation requirements related to safe electrical work procedures 7.2 Monitor and audit safe electrical work procedures 7.3 Determine and implement training needs

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit. Further information is available in the Resources and Infrastructure Industry Training Package Companion Volume.

Unit Mapping Information

No equivalent unit

Links

SkillsDMC RII Companion Volumes - http://www.skillsdmc.com.au/

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Assessment Requirements for RIIRAI609D Establish and maintain electrical installations, reticulation and protection system

Modification History

Plan and Prepare element added.

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Performance Evidence

Evidence is required to be collected that demonstrates a candidate's competency in this unit. Evidence must be relevant to the roles within this sector's work operations and satisfy all of the requirements of the performance criteria of this unit and include evidence that the candidate:

- locates and applies relevant legislation, documentation, policies and procedures
- implements procedures and techniques for the safe, effective and efficient completion of the establishing and maintenance of mine electrical installations, reticulation and protection systems including:
  - accessing, interpreting and applying legislative, organisation and site requirements and procedures
  - accessing, interpreting and applying:
  - technical information
  - records and reports
  - applying the principles of electrical installations, reticulation, control and protection system theory
  - applying procedures for the evaluation of designs and installations of electrical installations, reticulation, control and protection systems at a mine in terms of safety requirements
  - applying risk management processes for the risks associated with and consequences of failure of electrical installations, reticulation, control and protection systems at a mine
  - applying risk management processes for the risks associated with and consequences of changes to electrical installations, reticulation, control and protection systems at a mine
  - applying development procedures, for the management, operation, testing and maintenance of the mines electrical installations, reticulation, control and protection systems
  - applying procedures for the planning, coordination and documentation of work on the mines electrical installations, reticulation, control and protection systems
  - applying training needs analysis
- works effectively with others to establish and maintain mine electrical installations, reticulation and protection systems including:
  - managing people and processes
  - resolving conflict
  - coordinating human, financial and physical resources
  - developing, initiating and administering work plans
  - interpreting and applying operational performance data
  - engaging internal and external stakeholders
- demonstrates consistent and timely completion of the establishing and maintenance of mine electrical installations, reticulation and protection systems that effectively and efficiently meets the required outcomes on a minimum of one (1) separate occasion:
  - identifying the relevant information and scope of the work
  - identifying the full range of specification requirements
  - identifying all aspects of mine power supply systems

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- identifying options for power supply systems, electrical protection systems, and cables from power source to point of usage
-

Knowledge Evidence

The candidate must demonstrate knowledge of the in establishing and maintaining electrical installations, reticulation and protection systems through:

- legislative, organisation and site requirements and procedures for;
  - inspections and reporting
  - hazards associated with high energy systems in mining
- electrical protection theory, including earthing systems, coordination and fault level calculations, step and touch potential management
- fault discrimination and fault clearance characteristics of equipment
- mining electrical protection systems, including earth continuity monitoring, earth leakage protection, earth fault current limitation and relevant standards
- typical low and high voltage switching and distribution systems on mines
- transient over-voltages, harmonics and lightning theory, hazards and protection schemes
- mining cables, faults and consequences, cable protection systems, standards and cable repair
- classification of hazardous areas and explosion-protected electrical equipment principles, general requirements, verification, testing and standards
- automatic control system hazards, protection schemes and standards
- electromagnetic interference hazards, protection schemes and standards
- management and control of processes for change to software and hard wired based systems
- electromagnetic interference hazards, protection schemes and standards
- radio remote control systems hazards, protection schemes and standards
- safety protective devices associated with welding machines such as Voltage Reducing Devices
- the principles of electrical installations, reticulation, control and protection system theory
- the risks associated with and consequences of failure of electrical installations, reticulation, control and protection systems at a mine
- the risks associated with and consequences of changes to electrical installations, reticulation, control and protection systems at a mine

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Assessment Conditions

- An assessor of this unit must satisfy the requirements of the NVR/AQTF or their successors; and Industry regulations for certification and licensing; and,
- this unit must be assessed in the context of this sector's work environment; and,
- this unit must be assessed using Resources and Infrastructure Industry sector specific policies, procedures, processes and operational manuals; and,
- an assessor must demonstrate the skills and knowledge of this unit through twelve (12) month work experience in an Industry relevant to the skills being assessed within the last three (3) years; and,
- where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must demonstrate competency in the unit being assessed, and be currently working in the sector with a minimum of twelve (12) months' work experience within the last three (3) years.

Links

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RIIRIS601D Establish and maintain the risk management system

Modification History

Not applicable.

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Application

This unit describes a participant's skills and knowledge required to establish and maintain the risk management system in the Resources and Infrastructure Industries.
This unit is appropriate for those working in management roles.
No licensing, legislation or certification requirements apply to this unit at the time of publication.

Elements and Performance Criteria

1. Plan and prepare to establish the framework for the risk management system	1.1 Access, interpret and apply risk management documentation, and ensure the work activity is compliant 1.2 Develop the policy and objectives that express the organisation's commitment to risk management 1.3 Establish and implement the structure and framework 1.4 Define, allocate and document responsibilities for risk management in job descriptions and duty statements
2. Establish processes to support the risk management system	2.1 Develop, document and communicate procedures covering risk identification, assessment, treatment, communication, consultation, monitoring and review 2.2 Provide or arrange appropriate development and/or training for personnel 2.3 Identify, obtain and maintain information sources to support the system, and make them available to personnel to implement 2.4 Provide information on known and intended process changes and enhancements to responsible personnel 2.5 Determine and make available organisation's criteria for assessing the acceptability of risks to responsible personnel 2.6 Obtain and provide expert advice to responsible personnel
3. Plan and facilitate the implementation of the risk management system	3.1 Plan, schedule and document the systems coverage 3.2 Monitor activities and achievement targets, and provide and focus resources to ensure the work plan is satisfied 3.3 Provide support and encouragement to those responsible for the system activities 3.4 Review and update the system work plan when changing circumstances are anticipated or occur
4. Audit the management processes	4.1 Formally audit risk management processes, including operating procedures and implementation processes, to ensure compliance and effectiveness

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	4.2 Respond to changed requirements disclosed during audits in a systematic and timely manner 4.3 Complete and retain risk management documentation including the reasons for and changes made to the system
5. Monitor completion of records and reports	5.1 Ensure all risk management documentation is produced and processed 5.2 Ensure all risk management documentation is maintained

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit. Further information is available in the Resources and Infrastructure Industry Training Package Companion Volume.

Unit Mapping Information

RIIRIS601A Establish and maintain the risk management system

Links

SkillsDMC RII Companion Volumes - http://www.skillsdmc.com.au/

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Assessment Requirements for RIIRIS601D Establish and maintain the risk management system

Modification History

Not applicable.

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Performance Evidence

Evidence is required to be collected that demonstrates a candidate's competency in this unit. Evidence must be relevant to the roles within this sector's work operations and satisfy all of the requirements of the performance criteria of this unit and include evidence that the candidate:

- locate and apply relevant documentation, policies and procedures
- demonstrates consistent timely conduct of establishing and maintaining risk management system that safely, effectively and efficiently meets the required outcomes on a minimum of one (1) occasion including:
  - reading, interpreting and applying risk management legislation to develop and maintain risk management systems
  - applying procedures for developing and maintaining procedures and policies
  - applying procedures for facilitating and documenting management planning
  - applying procedures for monitoring and deciding on changes to process
  - explaining complex risk management information to superiors/subordinates
  - applying coaching and mentoring support to supervisors who are carrying out risk management activities
  - actively encouraging the free exchange of information through consultation, using technology mediums and policies
  - preparing written reports communicating the options for managing risk, clarifying the decision and reviewing of outcomes
  - performing audits of risk management processes, recognising positive behaviours of others contributing to the management of risk, and providing direction and amendment to others and processes when the compliance is not achieved
  -

Knowledge Evidence

The candidate must demonstrate knowledge of establishing and maintaining risk management systems through:

- applies active listening, identifies barriers to communication and provides clarification to make meaning
- action planning methods
- actions based on cost, safety, and welfare issues
- work procedures
- risk management system reporting and recording procedures
- hazard identification, risk assessment and risk treatment processes
-

Assessment Conditions

- An assessor of this unit must satisfy the requirements of the NVR/AQTF or their successors; and Industry regulations for certification and licensing; and,
- this unit is best assessed in the context of this sector's work environment;

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- where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of this sector's workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills; and,
- this unit must be assessed using Resources and Infrastructure Industry sector specific policies, procedures, processes and operational manuals; and,
- assessor requirements differ between sectors as follows:
  - when assessing this unit in the context of the **Drilling** sector:
    - an assessor must demonstrate the performance evidence, and knowledge evidence as outlined in this Unit of Competency, and through five (5) years of work in the Industry sector; or,
    - where a co-assessment or partnership arrangement exists between a qualified assessor and an Industry technical expert, the Industry technical expert can hold the unit being assessed, and/or demonstrate equivalency of skills and knowledge at the unit level. An Industry technical expert must also demonstrate a minimum of three (3) years of continuous work in the Industry sector, with the preceding one (1) year in the unit they are co-assessing; or,
  - when assessing this unit in the context of the **Metalliferous Mining** sector:
    - an assessor must demonstrate the skills and knowledge of this unit through five (5) years of current and continuous work with the Industry sector and must hold the TAE Assessor Skill Set or equivalent; or,
  - when assessing this unit in the context of the **Coal Mining** sector:
    - an assessor must demonstrate the skills and knowledge of this unit through twelve (12) month work experience in an Industry relevant to the skills being assessed within the last three (3) years; and,
    - where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must demonstrate competency in the unit being assessed, and be currently working in the sector with a minimum of twelve (12) months' work experience within the last three (3) years; or,
  - when assessing this unit in the context of the **Extractive** sector
    - an assessor must demonstrate the skills and knowledge of this unit through five (5) years' work experience in the Industry sector; and,
    - where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must hold the unit being assessed and be currently working in the sector with a minimum of two (2) years' of current work experience; or,
  - when assessing this unit in the context of the **Civil Construction** sector
    - an assessor must demonstrate the skills and knowledge of this unit through five (5) years' work experience in the Industry sector; and,
    - where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must

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RIIWHS202D Enter and work in confined spaces

Modification History

Not applicable.

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Application

This unit describes a participant's skills and knowledge required to enter and work in confined spaces in the Resources and Infrastructure Industries.
This unit is appropriate for those working in operational roles undertaking work in confined spaces.
Licensing, legislative, regulatory and certification requirements that apply to this unit can vary between states, territories, and Industry sectors. Relevant information must be sourced prior to application of the unit.

Elements and Performance Criteria

1 Plan and prepare for working in confined space	1.1 Access, interpret and apply procedures for confined space entry and the environmental management plan and ensure the work activity is compliant 1.2 Obtain, confirm, clarify and apply work instructions and agreed procedure 1.3 Obtain, confirm, clarify and apply safety requirements 1.4 Obtain and confirm authorisation (entry permit) meets regulatory requirements 1.5 Confirm the emergency response procedure is with the stand-by person and understood 1.6 Identify, obtain and implement signage and barrier requirements 1.7 Select tools and equipment for the tasks, check for serviceability and rectify or report any faults 1.8 Identify, confirm and apply the environmental protection requirements 1.9 Position rescue equipment by the entry permit
2 Work in confined space	2.1 Gain access to confined space 2.2 Ensure that the atmosphere is tested and monitored for harmful elements 2.3 Correctly apply tagging and lock-out procedures 2.4 Enter the confined space correctly 2.5 Maintain ongoing communication with the stand-by person 2.6 Comply with entry permit requirements 2.7 Monitor and adhere to allocated entry time
3 Exit confined space	3.1 Exit confined space correctly

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	3.2	Recover tools, equipment and materials
	3.3	Conduct inspection of the confined space
	3.4	Secure access to the confined space
	3.5	Remove tagging and lock-out
	3.6	Accurately complete confined space entry permit
4 Clean up	4.1	Clear work area and dispose of or recycle materials
	4.2	Clean, check, maintain and store tools and equipment
	4.3	Remove, clean and store barriers and signs

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit. Further information is available in the Resources and Infrastructure Industry Training Package Companion Volume.

Unit Mapping Information

RIIOHS202A Entering and working in confined spaces

Links

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Assessment Requirements for RIIWHS202D Enter and work in confined spaces

Modification History

Not applicable.

Performance Evidence

Evidence is required to be collected that demonstrates a candidate's competency in this unit. Evidence must be relevant to the roles within this sector's work operations and satisfy all of the requirements of the performance criteria of this unit and include evidence that the candidate:

- locates and applies relevant documentation, policies and procedures
- demonstrates consistent timely completion of entering and working in confined spaces that safely, effectively and efficiently meets the required outcomes on three (3) separate occasions including:
- obtain appropriate entry permit and instructions for performing work in confined space
- interpreting and applying safe work method statements
- apply tagging and lock out
- selecting, wearing and caring for personal protective equipment applicable to all tasks and environment identified
- entering the confined space
- using atmospheric monitoring devices prior to entering the confined space
- working in the confined space
- using atmospheric monitoring devices during confined space activity
- applying safe materials handling methods
- exiting the confined space
- remove tagging and lock out

Knowledge Evidence

The candidate must demonstrate knowledge of enter and work in confined spaces through:

- identifying areas that constitute confined spaces
- complying with site and equipment safety requirements
- complying with the entry and exit procedures, risks and regulations
- types of air contaminants and toxic gases
- identifying the limitations of breathing apparatus
- identifying equipment types, characteristics, technical capabilities and limitations
- complying with site isolation and site control responsibilities and authorities
- locations of safety data sheets (SDS) information and application
- using confined space and Industry terminology

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Assessment Conditions

- An assessor of this unit must satisfy the requirements of the NVR/AQTF or their successors; and Industry regulations for certification and licensing; and,
- this unit is best assessed in the context of this sector's work environment;
- where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of this sector's workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills; and,
- this unit must be assessed using Resources and Infrastructure Industry sector specific policies, procedures, processes and operational manuals; and,
- assessor requirements differ between sectors as follows:
  - when assessing this unit in the context of the **Drilling** sector:
    - an assessor must demonstrate the performance evidence, and knowledge evidence as outlined in this Unit of Competency, and through five (5) years of work in the Industry sector; or,
    - where a co-assessment or partnership arrangement exists between a qualified assessor and an Industry technical expert, the Industry technical expert can hold the unit being assessed, and/or demonstrate equivalency of skills and knowledge at the unit level. An Industry technical expert must also demonstrate a minimum of three (3) years of continuous work in the Industry sector, with the preceding one (1) year in the unit they are co-assessing; or,
  - when assessing this unit in the context of the **Metalliferous Mining** sector:
    - an assessor must demonstrate the skills and knowledge of this unit through five (5) years of current and continuous work with the Industry sector and must hold the TAE Assessor Skill Set or equivalent; or,
  - when assessing this unit in the context of the **Coal Mining** sector:
    - an assessor must demonstrate the skills and knowledge of this unit through twelve (12) month work experience in an Industry relevant to the skills being assessed within the last three (3) years; and,
    - where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must demonstrate competency in the unit being assessed, and be currently working in the sector with a minimum of twelve (12) months' work experience within the last three (3) years; or,
  - when assessing this unit in the context of the **Extractive** sector
    - an assessor must demonstrate the skills and knowledge of this unit through five (5) years' work experience in the Industry sector; and,
    - where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must hold the unit being assessed and be currently working in the sector with a minimum of two (2) years' of current work experience; or,
  - when assessing this unit in the context of the **Civil Construction** sector

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- an assessor must demonstrate the skills and knowledge of this unit through five (5) years' work experience in the Industry sector; and,
- where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must hold the unit being assessed and be currently working in the sector with a minimum of two (2) years' of current work experience.

Links

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RIIWHS204D Work safely at heights

Modification History

Not applicable.

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Application

This unit describes a participant's skills and knowledge required to work safety at heights in the Resources and Infrastructure Industries.
This unit it appropriate for those working in operational roles where they are required to perform work at heights.
Licensing, legislative, regulatory and certification requirements that apply to this unit can vary between states, territories, and Industry sectors. Relevant information must be sourced prior to application of the unit.

Elements and Performance Criteria

1 Identify work requirements	1.1 Access, interpret and apply height safety procedures and ensure the work activity is compliant 1.2 Identify and prepare written documentation for the scope of the task and proposed work practices/activities 1.3 Adhere to WHS requirements 1.4 Inspect site to determine layout and physical condition, condition of structures, prevailing weather conditions, equipment requirements and potential hazards 1.5 Identify, select and check safety equipment for serviceability 1.6 Identify, manage and report potential risks and hazards
2 Identify work procedures and instructions	2.1 Select materials, tools and equipment and check for serviceability 2.2 Select, wear and care for personal protective equipment 2.3 Inspect/install fall protection and perimeter protection equipment 2.4 Identify approved methods of moving tools and equipment to work area and minimise potential hazards associated with tools at heights 2.5 Install safety system correctly 2.6 Select and install appropriate signs and barricades
3 Access and install equipment	3.1 Correctly fit, adjust and anchor fall protection and associated equipment 3.2 Make arrangements to install required equipment 3.3 Use recommended methods to access work area for people, tools and equipment 3.4 Locate tools and materials to eliminate or minimise the risk of items being knocked down

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4 Perform work at heights	4.1 Check access from ground to work area and ensure it is safe 4.2 Keep fall equipment in place and adjusted appropriately for movement during work 4.3 Undertake manual handling of materials and equipment 4.4 Locate materials and equipment ensuring that they are safely secured and distributed 4.5 Check safety system periodically for compliance 4.6 Monitor risk control measures to ensure that they are effective and appropriate 4.7 Reassess risk control measures, as required, in accordance with changed work practices and/or site conditions and undertake alterations
5 Clean up work area	5.1 Dismantle and remove safety system 5.2 Clear work area and dispose of or recycle materials 5.3 Clean, check, maintain and store tools and equipment

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit. Further information is available in the Resources and Infrastructure Industry Training Package Companion Volume.

Unit Mapping Information

RIIOHS204A Working safely at heights

Links

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Assessment Requirements for RIIWHS204D Work safely at heights

Modification History

Not applicable.

Performance Evidence

Evidence is required to be collected that demonstrates a candidate's competency in this unit. Evidence must be relevant to the roles within this sector's work operations and satisfy all of the requirements of the performance criteria of this unit and include evidence that the candidate:

- locates and applies relevant documentation, policies and procedures
- demonstrates consistent timely completion of work at heights that safely, effectively and efficiently meets the required outcomes on a minimum of three (3) separate occasions including:
  - accessing, interpreting and applying technical and safety information for working at heights
  - assessing hazards and risk associated with working at heights and implement control methods
  - selecting wearing and caring for personal protective equipment
  - identifying required safety systems including fall protection and associated equipment
  - correctly fitting, adjusting and anchoring of fall protection and associated equipment
  - performing work safely at heights
  - dismantle and remove safety systems

Knowledge Evidence

The candidate must demonstrate knowledge of working safely at heights through:

- names and functions of equipment, components and materials
- complying with equipment manufacturer's instructions and specifications
- safe shifting and handling of tools and materials
- adhering to statutory and regulatory authority requirements
- the nature of work undertaken at heights
- complying with heights safety systems
- the processes of providing for safe working practices
- using safety equipment/systems and considerations to facilitate working safely at heights
- complying with safe work methods

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Assessment Conditions

- An assessor of this unit must satisfy the requirements of the NVR/AQTF or their successors; and Industry regulations for certification and licensing; and,
- this unit is best assessed in the context of this sector's work environment;
- where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of this sector's workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills; and,
- this unit must be assessed using Resources and Infrastructure Industry sector specific policies, procedures, processes and operational manuals; and,
- assessor requirements differ between sectors as follows:
  - when assessing this unit in the context of the **Drilling** sector:
    - an assessor must demonstrate the performance evidence, and knowledge evidence as outlined in this Unit of Competency, and through five (5) years of work in the Industry sector; or,
    - where a co-assessment or partnership arrangement exists between a qualified assessor and an Industry technical expert, the Industry technical expert can hold the unit being assessed, and/or demonstrate equivalency of skills and knowledge at the unit level. An Industry technical expert must also demonstrate a minimum of three (3) years of continuous work in the Industry sector, with the preceding one (1) year in the unit they are co-assessing; or,
  - when assessing this unit in the context of the **Metalliferous Mining** sector:
    - an assessor must demonstrate the skills and knowledge of this unit through five (5) years of current and continuous work with the Industry sector and must hold the TAE Assessor Skill Set or equivalent; or,
  - when assessing this unit in the context of the **Coal Mining** sector:
    - an assessor must demonstrate the skills and knowledge of this unit through twelve (12) month work experience in an Industry relevant to the skills being assessed within the last three (3) years; and,
    - where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must demonstrate competency in the unit being assessed, and be currently working in the sector with a minimum of twelve (12) months' work experience within the last three (3) years; or,
  - when assessing this unit in the context of the **Extractive** sector
    - an assessor must demonstrate the skills and knowledge of this unit through five (5) years' work experience in the Industry sector; and,
    - where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must hold the unit being assessed and be currently working in the sector with a minimum of two (2) years' of current work experience; or,
  - when assessing this unit in the context of the **Civil Construction** sector

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- an assessor must demonstrate the skills and knowledge of this unit through five (5) years' work experience in the Industry sector; and,
- where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must hold the unit being assessed and be currently working in the sector with a minimum of two (2) years' of current work experience.

Links

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RIIWHS205D Control traffic with stop-slow bat

Modification History

Performance criteria numbering for element 1 corrected.

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Application

This unit describes a participant's skills and knowledge required to control traffic with stop-slow bat in the Resources and Infrastructure Industries.
This unit is appropriate for those working in operational roles.
Licensing, legislative, regulatory and certification requirements that apply to this unit can vary between states, territories, and Industry sectors. Relevant information must be sourced prior to application of the unit.

Pre-requisite Unit

Unit Sector

Elements and Performance Criteria

1. Plan and prepare	1.1 Access, interpret and apply site traffic plan procedures and ensure the work activity is compliant 1.2 Obtain, confirm, clarify and apply work instructions 1.3 Obtain, confirm, clarify and apply safety requirements 1.4 Identify, obtain and implement signage and devices 1.5 Select tools and equipment, check for serviceability and rectify or report any faults 1.6 Identify, confirm, clarify and apply environmental protection requirements
2. Control traffic	2.1 Position or confirm temporary traffic signs and barriers 2.2 Direct traffic correctly 2.3 Control vehicles and pedestrian traffic and ensure safety 2.4 Monitor traffic, make adjustments for changing conditions and position waiting vehicles for smooth traffic flow 2.5 Use hand held stop/slow bats 2.6 Use visibly clear and unobstructed hand signals 2.7 Report traffic offenders
3. Operate communication devices	3.1 Adjust communication device controls for optimum reception/transmission results 3.2 Transmit messages clearly and concisely 3.3 Maintain communication device power supply 3.4 Check communications contact after nominated period of

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	non-contact
4. Clean up	4.1 Remove or cover signs and devices sequentially to provide warning to motorists during shutdown 4.2 Clean, check, maintain and store tools and equipment

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit. Further information is available in the Resources and Infrastructure Industry Training Package Companion Volume.

Range of Conditions

Unit Mapping Information

RIIOHS205A Control traffic with stop-slow bat

Links

SkillsDMC RII Companion Volumes - http://www.skillsdmc.com.au/

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Assessment Requirements for RIIWHS205D Control traffic with stop-slow bat

Modification History

Not applicable.

Performance Evidence

Evidence is required to be collected that demonstrates a candidate's competency in this unit. Evidence must be relevant to the roles within this sector's work operations and satisfy all of the requirements of the performance criteria of this unit and include evidence that the candidate:

- locates and applies relevant documentation, policies and procedures
- demonstrates consistent timely control of traffic with a stop-slow bat that safely, effectively and efficiently meets the required outcomes on a minimum of three (3) separate occasions including:
  - reading and interpreting the work instruction and planning work activity accordingly
  - positioning signage and barriers
  - directing and controlling vehicle traffic
  - directing and controlling pedestrian traffic
  - communicating to drivers and pedestrians clearly using hand signals
  - using approved communication devices such as hand held radios or phones to transmit message and report of offenders
  - removing or covering signs after work completion

Knowledge Evidence

The candidate must demonstrate knowledge of controlling traffic with stop-slow bat through:

- site and equipment safety requirements
- traffic controlling requirements and procedures
- complying with traffic management plans
- erecting traffic control signage and barricades
- communication device operations
- determine equipment types, characteristics, technical capabilities and limitations
- operational and maintenance procedures for equipment
- detailing site isolation and traffic control responsibilities and authorities
- describing the effects of travel speed and vehicle mass on stopping distances
- interpreting and implementing safe work method statement

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Assessment Conditions

- An assessor of this unit must satisfy the requirements of the NVR/AQTF or their successors; and Industry regulations for certification and licensing; and,
- this unit is best assessed in the context of this sector's work environment;
- where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of this sector's workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills; and,
- this unit must be assessed using Resources and Infrastructure Industry sector specific policies, procedures, processes and operational manuals; and,
- assessor requirements differ between sectors as follows:
  - when assessing this unit in the context of the **Drilling** sector:
    - an assessor must demonstrate the performance evidence, and knowledge evidence as outlined in this Unit of Competency, and through five (5) years of work in the Industry sector; or,
    - where a co-assessment or partnership arrangement exists between a qualified assessor and an Industry technical expert, the Industry technical expert can hold the unit being assessed, and/or demonstrate equivalency of skills and knowledge at the unit level. An Industry technical expert must also demonstrate a minimum of three (3) years of continuous work in the Industry sector, with the preceding one (1) year in the unit they are co-assessing; or,
  - when assessing this unit in the context of the **Metalliferous Mining** sector:
    - an assessor must demonstrate the skills and knowledge of this unit through five (5) years of current and continuous work with the Industry sector and must hold the TAE Assessor Skill Set or equivalent; or,
  - when assessing this unit in the context of the **Coal Mining** sector:
    - an assessor must demonstrate the skills and knowledge of this unit through twelve (12) month work experience in an Industry relevant to the skills being assessed within the last three (3) years; and,
    - where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must demonstrate competency in the unit being assessed, and be currently working in the sector with a minimum of twelve (12) months' work experience within the last three (3) years; or,
  - when assessing this unit in the context of the **Extractive** sector
    - an assessor must demonstrate the skills and knowledge of this unit through five (5) years' work experience in the Industry sector; and,
    - where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must hold the unit being assessed and be currently working in the sector with a minimum of two (2) years' of current work experience; or,
  - when assessing this unit in the context of the **Civil Construction** sector

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- an assessor must demonstrate the skills and knowledge of this unit through five (5) years' work experience in the Industry sector; and,
- where the assessor does not have current experience a co-assessment or partnership arrangement needs to exist between the qualified assessor and an Industry technical expert/ subject matter expert. The Industry technical expert/subject matter expert must hold the unit being assessed and be currently working in the sector with a minimum of two (2) years' of current work experience.

Links

SkillsDMC RII Companion Volumes - http://www.skillsdmc.com.au/

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TLILIC2001A Licence to operate a forklift truck

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor	This unit specifies the outcomes required for the operation of a powered industrial truck equipped with a mast and an elevating load carriage to which is attached a pair of fork arms or other attachment, for licensing purposes. This definition also includes a truck on which the operator is raised with the attachment for order-picking.

Application of the Unit

Application of the Unit	THIS UNIT REQUIRES THE OPERATOR TO BE ABLE PLAN THE WORK, CONDUCT ROUTINE CHECKS ON THE FORKLIFT, SHIFT LOADS IN A SAFE MANNER, AND SHUT DOWN AND SECURE THE EQUIPMENT AFTER THE COMPLETION OF OPERATIONS. This unit is based on the National Standard for Licensing Persons Performing High Risk Work. This unit in its current form meets state and territory licensing requirements. Any alteration will result in a unit which is not acceptable to regulators for the purpose of licensing.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Not Applicable

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Employability Skills Information

Employability Skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Not Applicable

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Elements and Performance Criteria

ELEMENT *Elements describe the essential outcomes of a unit of competency.*	**PERFORMANCE CRITERIA** *Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1. Plan work	1.1 Potential workplace ***hazards*** are identified 1.2 ***Hazard control measures*** are identified consistent with ***appropriate standards*** to ensure the safety of personnel and equipment 1.3 Appropriate ***forklift*** truck is selected according to the load and workplace conditions 1.4 Working area is inspected to determine appropriate path of movement for loads and forklift truck 1.5 ***Communication methods*** are identified according to ***procedures***
2. Conduct routine checks	2.1 Forklift is visually checked for any damage or defects 2.2 All ***signage and labels*** are visible and legible according to the ***appropriate standard*** 2.3 All controls are located and identified 2.4 ***Pre-start operational checks*** are carried out according to ***procedures*** 2.5 ***Forklift*** is started according to ***procedures*** and checked for any abnormal noise 2.6 ***Post-start operational checks*** are carried out according to ***procedures*** 2.7 All forklift functions and safety devices are tested to their maximum according to ***procedures*** 2.8 Defects and damage are reported and recorded according to ***procedures***, and appropriate action is taken
3. Shift load	3.1 The weight of load is assessed to ensure compliance with ***forklift*** truck data plate specifications 3.2 Appropriate ***hazard prevention/control measures*** are implemented and communicated with personnel in the work area 3.3 ***Forklift*** is operated at a safe speed and according to ***procedures*** 3.4 Loads are moved and placed to ensure stability of material and avoidance of hazards

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	3.5 Load movement is monitored constantly ensuring safety to personnel and load, and structural stability 3.6 ***Unplanned and/or unsafe situations*** are responded to in line with ***procedures***
4. Shut down and secure forklift truck	4.1 ***Forklift*** truck is parked to avoid hazards 4.2 Forklift is ***shut down*** according to ***procedures*** 4.3 Routine post-operational forklift checks are carried out according to ***procedures*** 4.4 Forklift is secured to prevent unauthorised access/use 4.5 All defects and damage are reported and recorded according to ***procedures***, and appropriate action is taken

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This describes the essential skills and knowledge and their level required for this unit.
Required skills:
• Accurately interpret information relating to conducting forklift truck operations (e.g. procedures) • Safely conduct forklift truck operations including all functions to the maximum height and load capacity • Identify hazards associated with the operation of the forklift truck, assess risks and put into place effective hazard prevention/control measures for those hazards identified • Use communication skills at a level sufficient to communicate with other site personnel (e.g. receive and interpret work instructions, safety information, emergency procedures) • Drive forklift with load in forward and reverse, maintaining visibility • Verify problems and equipment faults and demonstrate appropriate response procedures
Required knowledge:
• Methodology of determining the weight of a load • Commonwealth, state or territory OH&S legislation, standards relevant to the safe operation for the forklift trucks • Understanding of forklift characteristics and capabilities (including use of load data plates) • Understanding of the hierarchy of hazard identification and control • Organisational and workplace standards, requirements, policies and procedures for

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REQUIRED SKILLS AND KNOWLEDGE
conducting operations for the crane class • Procedures for the recording, reporting and maintenance of workplace records and information • Forklift truck operations and safe operating techniques • Typical routine problems encountered in the operation of the crane and equipment and adjustments required for correction

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the assessment guidelines for the Training Package.	
Overview of assessment	• Successful assessment of this unit meets the competency requirement of the National Standard for Licensing Persons Performing High Risk Work. • State/territory OH&S regulators have mandated the use of Assessment Instruments and Instructions for Assessment for this unit which have been endorsed by the national body responsible for OH&S matters.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	• Compliance with OH&S licensing legislation. • Communicate and work safely with others in the work area. • Identify hazards associated with the operation of the forklift truck and put in place effective hazard controls for those hazards identified. • Conduct pre-start-up, operational, moving loads and shut down and secure checks of the forklift truck according to procedures. • Operate the forklift truck and move loads safely, including driving and manoeuvring, picking up and placing of loads at various stack heights. • Drive forklift truck with load in forward and reverse, maintaining visibility.
Context of and specific resources for assessment	• Assessment of the safe application of knowledge and skills to workplace tasks (performance) must be undertaken using the endorsed Assessment Instrument.

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EVIDENCE GUIDE	

	• Assessment of performance must be undertaken either in the workplace or in a realistically simulated workplace setting.
	• Assessment must occur under standard and authorised work practices, safety requirements and environmental constraints.
	• Applicants must have access to:
	  • Personal Protective Equipment (PPE) for the purpose of the Performance Assessment
	  • associated equipment appropriate to forklift truck operations
	  • suitable loads as described by the endorsed Assessment Instrument
	  • manufacturers specifications
	  • appropriate forklift truck in a safe condition.

Method of assessment	• Assessment must be conducted using the endorsed Assessment Instrument. These Instruments provide instruction on their application. • The use of '**simulators'** in the assessment of this unit of competency is **not acceptable**. • Assessment may be in conjunction with the assessment of other units of competency. • Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge. • Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
Guidance information for assessment	• Further information about endorsed Assessment Instruments may be obtained from state/territory OH&S regulators.

Range Statement

RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below.

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RANGE STATEMENT	
Hazards	May include but not limited to: • ground conditions (e.g. condition of pavement, slopes) • overhead hazards (e.g. powerlines, service pipes) • insufficient lighting • traffic (e.g. pedestrians, vehicles, other plant) • weather (e.g. wind, lightning, rain) • forklift instability (e.g. overloading, poor load placement, irregular loads) • other hazards (e.g. dangerous materials)
Hazard control measures	Refers to the systematic process of eliminating or reducing the risk to personnel and property through the application of controls It includes the application of the hierarchy of control, the six-step preference of control measures to manage and control risk: 1 elimination 2 substitution 3 isolation 4 engineering control measures 5 using safe work practices 6 personal protective equipment
Appropriate standards	May include but not limited to: • legislation • Australian standards • manufacturer's specifications • industry standards (where applicable)
Forklift truck	May include but not be limited to: • counterbalanced • reach trucks • rough terrain • internal combustion petrol, diesel, gas • electric
Communications methods	May include but not limited to: • verbal and non-verbal language • written instructions • signage

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RANGE STATEMENT	
	• hand signals • listening • questioning to confirm understanding • appropriate worksite protocol
Procedures	May include but not limited to: • manufacturer's guidelines (instructions, specifications or checklists) • industry operating procedures • workplace procedures (work instructions, operating procedures, checklists)
Pre-start operational checks	May include but not limited to: • safety devices fitted where appropriate • forklift data plate fitted and interpreted • logbook, handbook or operating manuals available • external visual check including, evidence of damage, leaks, visual evidence of structural weaknesses (including paint separation or stressed welds) is carried out • forklift attachment is checked for security • approved modifications and/or attachments fitted to manufacturer's specifications (e.g. as per forklift or attachment data plate) are identified • checks for adaptations or modifications outside manufacturer's specifications (e.g. not listed on the forklift or attachment data plate) are carried out • maintenance logbook/records checked
Post-start operational checks	May include checks of the forklift truck and equipment after start-up to ensure: • hazard warning systems (for example lights and horns), are functional • attachment movements and control functions are smooth and comply with operating requirements • steering, transmission and brake functions comply with operating requirements
Hazard prevention/control measures	May include but not limited to: • barricades and traffic control • safety tags on electrical switches/isolators

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RANGE STATEMENT	
	• insulated powerlines • safety observer used inside exclusion zone • disconnected power • pedestrian control (barricades, signs, etc.) • excavation safeguards • movement of obstructions • personal protective equipment • adequate illumination
Unplanned and/or unsafe situations	May include but not limited: • failure/loss of control (e.g. brakes and steering) • failure of equipment (e.g. hydraulic system) • environmental condition
Shut down	May include, but is not limited to: • parking in a suitable location away from dangerous areas • fork arms are correctly positioned (tips down, tilted forward, lowered to ground) • appropriate transmission/gear is selected for parking (relevant to transmission type) • hand/parking brake is applied • engine power is turned off • ignition key is removed (if applicable) • LPG gas cylinder valve is shut off (where fitted) • securing equipment against unauthorised operation • securing the site • ensuring access ways are clear • identifying and segregating defective equipment and reporting to authorised personnel • batteries are connected to the charger (if applicable)

Unit Sector(s)

Not Applicable

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TLIS2004A Install and maintain rail bonding systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

This unit involves the skills and knowledge required to install and maintain all types of temporary and permanent bonds and bonding cables in use in the Australian rail system in accordance with safeworking and regulatory requirements and workplace procedures. This includes planning the installation and maintenance, preparing the worksite, installing and maintaining the bonds and bonding cables, and conducting all required post-installation activities. Licensing, legislative, regulatory or certification requirements are applicable to this unit.

Application of the Unit

Application of the Unit

Persons achieving competence in this unit will need to fulfil the applicable legislated rail safety requirements including acts and regulations from each state and territory together with any nationally approved compliance codes and/or guidelines.

Work is performed under some supervision, generally within a team environment.

It involves the application of routine operational principles and procedures to install and maintain rail bonding systems as part of workplace activities across a variety of operational contexts within the Australian rail system.

Operators of mechanised equipment must have undertaken training and, where appropriate, hold the relevant licence, permit or certificate and be recognised as competent for the class of machinery being used.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Not Applicable

Employability Skills Information

Employability Skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan the installation and maintenance of the relevant bonding systems	1.1 Works order including drawings, plans and material lists is received/accessed, analysed and confirmed, if necessary by site inspection
	1.2 Work is prioritised/scheduled including site and relevant electrical permits
	1.3 Resources including personnel, plant, equipment and tools are identified and scheduled
	1.4 Liaison and communication issues with other personnel, authorities, clients and landowners are resolved
2 Prepare the worksite	2.1 Personnel participating in the task, including plant operators and contractors, are fully briefed
	2.2 Site preparation is completed in accordance with works order
	2.3 Where required, specialist testing and earth equipment is inspected and replaced if defective
	2.4 Where required, road signs, barriers and warning devices are positioned
	2.5 Safeworking practices are observed on or about the running track/line
3 Install and maintain bonding system cables	3.1 Systems and circuits are isolated as required, proved safe to work on in accordance with work plan and, where required, electrical permits are issued/accepted/relinquished
	3.2 Cable and surrounds, including rail and other surfaces, are prepared to appropriate specifications
	3.3 Bonds are attached in accordance with specifications
	3.4 Joint and termination procedures are carried out in accordance with authorised work procedures
	3.5 Continuity testing procedures are carried out as required
	3.6 The system is commissioned following the conduct of a visual inspection, and the completion of other testing
4 Conduct post-operational activities	4.1 Worksite is rehabilitated in accordance with workplace procedures
	4.2 Work is completed in an agreed time and with a minimum waste
	4.3 Notification, records and documentation for updating system data is completed

Required Skills and Knowledge

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REQUIRED KNOWLEDGE AND SKILLS

This describes the essential knowledge and skills and their level required for this unit.

Required knowledge:

- Applicable legislated rail safety requirements including acts and regulations from each state and territory together with any nationally approved compliance codes and/or guidelines
- Relevant OH&S and environmental procedures and regulations
- Workplace procedures for the installation and maintenance of rail bonding systems
- Problems that may occur during the installation and maintenance of rail bonding systems and action that can be taken to report or resolve the problems
- Hazards that may exist during the installation and maintenance of rail bonding systems and ways of controlling the risks involved
- Characteristics, capabilities and uses of various types of cables
- Cable testing and fault identification/location procedures
- Testing and commissioning procedures, including testing and earth/rail connecting conductors
- Traction earthing systems and bonding systems
- Basic circuits for signalling and communications systems
- Switching operation, isolation and access permit procedures
- Electrical principles including OHMs law, voltage and current transformation, voltage drop, cable
- Current capacities, inductance and capacitance, protection systems and devices
- The responsibilities and rights of other authorities, clients and landowners
- Regulatory and workplace traffic control requirements and guidance signals
- Relevant workplace documentation and records systems

Required skills:

- Communicate effectively with others when installing and maintaining rail bonding systems
- Read and interpret technical data, drawings, instructions and manuals relevant to the installation and maintenance of rail bonding systems
- Interpret and follow operational instructions and prioritise work
- Complete documentation related to the installation and maintenance of rail bonding systems
- Operate electronic communication equipment to required protocol
- Work collaboratively with others when installing and maintaining rail bonding systems
- Adapt appropriately to cultural differences in the workplace, including modes of behaviour and interactions with others
- Promptly report and/or rectify any identified problems, faults or malfunctions that may occur when installing and maintaining rail bonding systems in accordance with regulatory requirements and workplace procedures

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Required skills:

- Implement contingency plans for unplanned events that may arise when installing and maintaining rail bonding systems
- Apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
- Organise activities
- Monitor work activities in terms of planned schedule
- Modify activities depending on differing operational contingencies, risk situations and environments
- Work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- Select and use relevant equipment and tools
- Joint and terminate earthing and bonding cables
- Guide, using signals, operators of plant and equipment during the installation and maintenance of cables
- Work at heights and in confined spaces
- Perform basic and exothermic welding
- Adapt to differences in equipment in accordance with standard operating procedures
- Select and use required personal protective equipment conforming to industry and OH&S standards

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and skills, the range statement and the assessment guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	• The evidence required to demonstrate competency in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria of this unit and include demonstration of applying: • the underpinning knowledge and skills • relevant legislation and workplace procedures • other relevant aspects of the range statement
Context of and specific resources for assessment	• Performance is demonstrated consistently over a period of time and in a suitable range of contexts • Resources for assessment include: • a range of relevant exercises, case studies and/or

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EVIDENCE GUIDE

	other simulated practical and knowledge assessment, and/or • access to an appropriate range of relevant operational situations in the workplace • In both real and simulated environments, access is required to: • relevant and appropriate materials and equipment, and • applicable documentation including workplace procedures, regulations, codes of practice and operation manuals
Method of assessment	• Assessment of this unit must be undertaken by a registered training organisation • As a minimum, assessment of knowledge must be conducted through appropriate written/oral tests • Practical assessment must occur: • through activities in an appropriately simulated environment at the registered training organisation, and/or • in an appropriate range of situations in the workplace

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Operations may be conducted:	• by day or night
Work may be conducted in:	• restricted spaces • exposed conditions • controlled or open environments
Work may involve exposure to:	• chemicals • dangerous or hazardous substances • movements of equipment, goods and vehicles
Rail bonding systems to be installed and maintained may include all those in service in the Australian rail system, including:	• traction bonding (as required in all electrified rail systems) • track circuit continuity bonds • cross bonding

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RANGE STATEMENT

Maintenance may include:	• the diagnosis of faults and recommissioning • the repair and replacement of cables and associated hardware
Earthing and bonding systems may include:	• permanent systems • temporary systems • grading rings • earth grids
Types of conductors may include:	• steel • steel rail • copper • aluminium and steel • bare and sheathed cables • single core • stranded • flexible
Cables may include:	• surface mounted • aerial • buried • enclosed
Permanent jointing and terminating materials may include:	• polymeric tape materials • polymeric heat shrink and covering materials • exothermic welds • crimped connections • bolted connections
Temporary terminating components may include:	• screwed earth/rail/conductor clamps • clipped earth/rail/conductor clamps • sticks • testers
Communications equipment may include:	• two-way radios, and/or • telephones
Depending on work context, safety and protective equipment may include:	• high visibility clothing • hearing protection • gloves • sunscreen • sunglasses • safety glasses • insect repellent • safety headwear • safety footwear

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RANGE STATEMENT

	• portable radios • hand lamps • flags • safety devices
Depending on the type of organisation concerned and the local terminology used, workplace procedures may include:	• company procedures • enterprise procedures • organisational procedures • established procedures
Information/documents may include:	• applicable legislated rail safety requirements including acts and regulations from each state and territory together with any nationally approved compliance codes and/or guidelines • operational instructions, policies and workplace procedures • relevant logs or record books • work orders and specifications • technical instructions • manufacturers or workplace equipment instructions and operation manuals • emergency procedure manuals • two-way radio operation procedures • QA plans, data and document control • conditions of service, legislation and industrial agreements including workplace agreements and awards
Applicable procedures and codes may include:	• applicable legislated rail safety requirements including acts and regulations from each state and territory together with any nationally approved compliance codes and/or guidelines • relevant Australian Standards and related requirements, including AS 4292 • relevant state/territory OH&S legislation • relevant state/territory environmental protection legislation

Unit Sector(s)

Not Applicable

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Competency Field

Competency Field S - Construction and Installation

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UEPOPS202B Apply quality systems to work

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit deals with the skills and knowledge required to apply the desired standards to work as specified within the quality system.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to Occupational Health and Safety and where applicable contracts of training such as apprenticeships and the like.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed.

There are no pre-requisite units.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following levels. A description of what each level entails is provided in Section 2.3.1 Language, Literacy and Numeracy.

Reading	2	Writing	2	Numeracy	2

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Plan and prepare for quality systems	1.1	Appropriate quality systems/procedures are identified from enterprise and/or site quality systems requirements
		1.2	Performance objectives are identified and agreed with the team leader in accordance with work plan
		1.3	Work plan is structured to ensure quality standards are achieved in accordance with site requirements
		1.4	Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of the on-the-job training
2	Apply quality systems and practices	2.1	Quality assurance systems and practices are implemented by the individual in accordance with manufacturer's/site requirements
		2.2	Work is monitored against agreed standards, sustainable energy principles and clarified with appropriate personnel in accordance with site requirements
		2.3	Allocated jobs or tasks are completed in accordance with team/enterprise quality requirements
3	Initiate changes to quality systems	3.1	Improvements and changes to quality procedures are identified by analysis of systems outcomes in accordance with site requirements
		3.2	Extent and nature of proposed changes to quality procedures are identified following investigation

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ELEMENT	PERFORMANCE CRITERIA	
		of enterprise/technical requirements in accordance with site requirements
	3.3	Proposed changes are negotiated and agreed with appropriate parties in accordance with site requirements

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and enterprise quality management system.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-PO202B Enterprise quality management system, basic

Evidence shall show an understanding of enterprise quality management systems to an extent indicated by the following aspects:

T1 Quality Management Systems

- Purpose of a Quality Management System;
- Quality management system documentation, including work instructions (also known as work procedures or standard operating procedures), documentation templates, forms, and records;
  - Location of quality management system documentation and enterprise-based work instructions (including both hard-copy and electronic forms of documentation where appropriate);
  - Enterprise-based documentation and records including forms, records, databases

T2 Principles contained within the AS/NZS ISO 9001 quality management standard.

- Quality Assurance auditing principles, including external audits and internal audits

T3 Quality management tools and techniques, including the use and interpretation of:

- Flow charts;
- Cause-and-effect diagrams;
- Histograms;
- Run charts and graphs;
- Check sheets.

T4 Continuous improvement techniques

- Performance indicators;
- Techniques for generating improvement including quality circles, suggestion schemes, brainstorming

T5 Communication in a team environment

- Team meeting participation techniques;
- Participation in ‘buddy-training’

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REQUIRED SKILLS AND KNOWLEDGE

T6 Principles of sustainable energy practice

- Performance indicators
- Using enterprise-based systems to recommend and implement workplace improvements

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the competency standard unit and must be read in conjunction with the Performance Criteria and the Range Statement of the competency standard unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this competency standard unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence

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need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all pre-requisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEP12". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and Range Statement
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and Range Statement
  - Demonstrate an understanding of the Essential Knowledge and Associated Skills as described in 6) Essential Knowledge and Associated Skills of this unit
  - Demonstrate an appropriate level of employability skills
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Occupational, health and safety legislation; Statutory

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legislation; Enterprise/site safety procedures; Enterprise/site emergency procedures
- Australian and/or international standards related to quality systems
- The application of quality systems
- Identifying procedural change requirements
- Dealing with an unplanned event by drawing on Essential Knowledge and Skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this competency standard unit

Competency Standards should be assessed in the workplace or simulated workplace and under the normal range of workplace conditions.

Assessment of this unit will be supported with documentary evidence, by means of endorsement stating type and application of work.

In addition to the resources listed above in Context of assessment', evidence should show competency working in confined spaces with different types of plant and equipment as well as different structural/construction types and method and in a variety of environments.

Method of assessment

9.4)

This unit shall be assessed by methods given in Section 1.3.00 Assessment Guidelines.

Note:

Competent performance with inherent safe working practices is

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expected in the Industry to which this competency standard unit applies. This requires that the specified Essential Knowledge and Associated Skills be assessed in a structured environment that is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the Essential Knowledge and Skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no recommended concurrent assessments with this unit, however in some cases efficiencies may be gained in terms of learning and assessment effort being concurrently managed with allied competency standard units where listed.

Nil

Range Statement

RANGE STATEMENT

10) This relates to the competency standard unit as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

Quality assurance systems and procedures may includes document management systems, workplace policies and procedure, AS/NZS ISO 9001 compliance, sustainable energy principles and includes those factors defined in the glossary under ‘environment’

Work may be affected by Australian standards, Occupational Health and Safety standards, codes of practice, manufacturer’s specifications, environmental requirements and enterprise procedures

Generic terms are used throughout this Training Package for vocational standard shall be regarded as part of the Range Statement in which competency is demonstrated. Section 2.1 Preliminary Information and Glossaries contains a glossary of defined terms.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Operations

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UEPOPS337B Maintain quality systems within the team

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit deals with the skills and knowledge required to oversee compliance with performance indicators through the maintenance of quality systems within a team environment.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to Occupational Health and Safety and where applicable contracts of training such as apprenticeships.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed.

Common Unit Group

Unit Code	Unit Title
UEPOPS202B	Apply quality systems to work

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following levels. A description of what each level entails is provided in Section 2.3.1 Language, Literacy and Numeracy.

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Formulate team aspects of the quality system	1.1	Team quality assurance requirements/targets are identified or modified from an analysis of enterprise needs
		1.2	Team performance indicators, identified during team consultations, are agreed or referred to the appropriate party for approval in accordance with job requirements
		1.3	Compatibility between total team and total individual performance indicators is effectively co-ordinated in accordance with job requirements
		1.4	Site and team quality systems documentation is obtained, edited and summarised as required and made available to all members in accordance with job requirements
		1.5	Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of the on-the-job training
2	Facilitate team quality systems	2.1	Team members are provided with encouragement and training in team quality systems matters in accordance with job requirements
		2.2	The application of quality systems is monitored regularly both in the workplace and with customers in accordance with job requirements
		2.3	Instances of inability to satisfy key performance indicators are recorded, investigated and referred to team mechanisms and appropriate authorities

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ELEMENT	PERFORMANCE CRITERIA	
		for remedial actions in accordance with enterprise procedures
	2.4	Quality systems are regularly reviewed with the team to ensure their currency and continuing relevance in accordance with enterprise procedures
	2.5	Team quality systems records are maintained and made available to interest parties in accordance with enterprise procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and maintaining quality systems within a team.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-PO337B Maintain quality systems within the team

Evidence shall show an understanding of how to maintain quality systems within a team environment, to an extent indicated by the following aspects:

T1 Quality management theory

- Standardisation
- Waste
- Measurement
- Variation
- Control limits

T2 Quality Management System

- Elementary quality systems design processes
- Internal and third party auditing techniques
  - Sampling
  - Process mapping
  - Interviewing

T3 Performance reporting:

- Key result areas (accountabilities)
- Key performance indicators
- Quantitative measures
- Qualitative measures

T4 Advanced quality management tools and techniques, including the development, use and interpretation of:

- Pareto charts
- Run charts and graphs
- Range control charts
- Scattergrams
- 5-S

T5 Advanced continuous improvement techniques:

- Kaizen
- Techniques to measure, validate and value changes made to a process.

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REQUIRED SKILLS AND KNOWLEDGE

- Enterprise-based systems to recommend and implement workplace improvements.
- Lead employee participative initiative processes, including
  - Quality Circles
  - Brainstorming
  - Suggestion schemes

T6 Communication when leading a team:

- Team meeting techniques
  - action planning
  - minute taking

Structured on-the-job training techniques

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the Range Statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the

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most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all pre-requisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEP12". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and Range Statement
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and Range Statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in 6) Essential

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Knowledge and Associated Skills of this unit
  - Demonstrate an appropriate level of employability skills
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - Knowledge and application of relevant sections of: Occupational Health and Safety legislation; Statutory legislation; Enterprise/site safety procedures; Enterprise/site emergency procedures
  - Australian and/or international standards related to quality
  - Monitoring and reviewing quality systems
  - Maintaining records and documentation
  - Dealing with an unplanned event by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Competency Standards should be assessed in the workplace or simulated workplace and under the normal range of workplace conditions.

Assessment of this unit will be supported with documentary evidence, by means of endorsement stating type and application of work.

In addition to the resources listed above in Context of assessment', evidence should show competency working, in limited spaces, with different types of plant and equipment as well as different structural/construction types and methods and in a variety of environments.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Section 1.3.00 Assessment Guidelines.

Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no recommended concurrent assessments with this unit, however in some cases efficiencies may be gained in terms of learning and assessment effort being concurrently managed with allied competency standard units where listed.

Nil

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

Work may be affected by Australian standards, Occupational Health and Safety standards, codes of practice, manufacturer specifications, environmental requirements and enterprise procedures.

Generic terms are used throughout this Training Package for vocational standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms are given in Section 2.1 Preliminary Information and Glossaries.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Operations.

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UEPOPS416B Monitor the implementation of the enterprise's production-maintenance quality control procedures

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit deals with the skills and knowledge required to monitor the implementation of the production or maintenance quality control procedures at the enterprise level.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to Occupational Health and Safety.

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Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed.

Common Unit Group

Unit Code	Unit Title
UEPOPS338B	Maintain quality systems within the team

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following levels. A description of what each level entails is provided in Section 2.3.1 Language, Literacy and Numeracy.

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Plan for quality control	1.1	Occupational Health and Safety standards, statutory requirements, relevant Australian standards, codes of practice, manufacturers' specifications, environmental requirements and enterprise procedures are identified, applied and monitored throughout the work procedure
		1.2	Parameters are established accordance with standard procedures
		1.3	Knowledge of process improvement techniques are used to facilitate work groups to assist in the identification and resolution of quality variances
		1.4	Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of the on-the-job training
2	Monitor quality control	2.1	Monitoring equipment is checked for correct calibration and environmental conditions confirmed to ensure reliability and accuracy of tests and results where required
		2.2	Implement the enterprise quality control procedures
		2.3	Deviation and fault data is collected and reported in accordance with procedures
3	Complete documentation	3.1	Calibration records of test equipment maintained in accordance with standard operating procedures where required
		3.2	Documentation is completed in accordance with

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ELEMENT	PERFORMANCE CRITERIA
	procedures

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired monitoring the implementation of the enterprise's production/maintenance quality control procedures.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

The extent of the Essential Knowledge and Associated Skills required follows:

KS01 - PO416B Monitor the implementation of the enterprise's production/maintenance quality control procedures

T1 Evidence shall show that knowledge has been acquired for safe working practices of:

- Relevant environmental, occupational health and safety legislation and regulations
- Enterprise procedures
- Plant drawings and manufacturers manuals
- Introduction to and typical arrangements of power production plant
- Relevant plant and equipment, its location and operating parameters
- Relevant international and Australian standards
- Quality control procedures, processes and techniques
- Statistical analysis
- Monitoring equipment
- Inspection techniques
- Data analysis

T2 Specific skills needed to achieve the Performance Criteria:

- Interpret plant drawings and manufacturers manuals
- Apply relevant state and territory regulations
- Apply relevant international and Australian standards,
- Apply quality control procedures, processes and techniques
- Monitor quality control processes and techniques
- Perform statistical analysis
- Conduct inspections
- Identify variances to specifications
- Communicate effectively.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the competency standard unit and must be read in conjunction with the Performance Criteria and the Range Statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this competency standard unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be ‘rich’ in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its ‘richness’. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all pre-requisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEP12". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and Range Statement
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and Range Statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in 6) Essential Knowledge and Associated Skills of this unit
  - Demonstrate an appropriate level of employability skills
  - Conduct work observing the relevant Anti-Discrimination legislation, regulations, polices and workplace procedure
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - The knowledge and application of relevant sections of: Occupational Health and Safety legislation; Statutory legislation; Enterprise/site safety procedures; Enterprise/site emergency procedures
  - The application of quality control procedures, processes and techniques
  - Using specifications and manuals
  - Dealing with an unplanned event by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Competency Standards should be assessed in the workplace or simulated workplace and under the normal range of workplace conditions.

Assessment of this unit will be supported with documentary evidence, by means of endorsement stating type and application of work.

In addition to the resources listed above in Context of assessment', evidence should show competency working in limited spaces with different types of plant and equipment as well as different structural/construction types and methods and in a variety of environments.

Method of assessment

9.4)

This unit shall be assessed by methods given in Section 1.3.00 Assessment Guidelines.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

There are no recommended concurrent assessments with this unit, however in some cases efficiencies may be gained in terms of learning and assessment effort being concurrently managed with allied competency standard units where listed.

Nil

Range Statement

RANGE STATEMENT

10) This relates to the competency standard unit as a whole, providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

Quality assurance and quality control standards may refer to international and Australian standards.

Customers may be internal or external.

Monitoring equipment may include precision measuring instrument such as micrometres, multimeter, oscilloscope and vernier callipers, pressure and temperature indicators/recorders and vibration monitors/recorders.

Environmental conditions may be affected by nearby plant or processes.

Generic terms are used throughout this Training Package for vocational standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms are given in Section 2.1 Preliminary Information and Glossaries.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Operations

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UETTDRIS43A Perform low voltage field switching operation to a given schedule

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This Competency Standard Unit covers the conducting of low voltage switching operations involving the operation of circuit breaking and isolation devices from a given switching schedule and in accordance with enterprise procedures. It covers low voltage distribution systems in field situations but also includes paralleling in accordance with the switching schedule. It also encompasses the procedure of; communicating with the Switching Control Officer or Electrical Control Officer, isolating the electrical equipment and the line or work site, as well as proving that the area is de-energised and earthed, issuing/accepting electrical permits and the returning of the affected circuits to service.

Application of the Unit

Application of the Unit **2)**

This Competency Standard Unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may

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License to practice **3)**

require a licence/registration to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to Occupational Health and Safety, electricity/telecommunications/gas/water industry safety and compliance, industrial relations, environmental protection, anti discrimination and training. Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Transmission Overhead

Distribution Overhead

Rail Traction

Distribution Cable Jointing

Electrical

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits

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Prerequisite Unit(s) **4)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UETTDREL16A	Working safely near live electrical apparatus

Transmission Overhead Pathway Group

Unit Code	Unit Title
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
UETTDRIS54A	Install and maintain poles, structures, overhead conductors and cables
UETTDRTP26A	Install transmission structures and associated hardware
UETTDRTP27A	Maintain transmission structures and associated hardware
UETTDRTP29A	Install and maintain transmission overhead conductors and cables

Distribution Overhead Pathway Group

Unit Code	Unit Title
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDRDP12A	Maintain overhead energised low voltage conductors and cables

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Prerequisite Unit(s) **4)**

UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
UETTDRIS41A	Install network infrastructure electrical equipment
UETTDRIS42A	Maintain network infrastructure electrical equipment
UETTDRIS52A	Install and maintain poles, structures and associated hardware
UETTDRIS54A	Install and maintain poles, structures, overhead conductors and cables
UETTDRIS56A	Install and maintain low voltage overhead services

Rail Traction Pathway Group

Unit Code	Unit Title
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
UETTDRIS52A	Install and maintain poles, structures and associated hardware
UETTDRIS54A	Install and maintain poles, structures, overhead conductors and cables
UETTDRRT21A	Install traction overhead wiring systems
UETTDRRT22A	Maintain traction overhead wiring systems
UETTDRRT23A	Install rail traction bonds
UETTDRRT27A	Install overhead traction components and equipment
UETTDRRT28A	Maintain overhead traction

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Prerequisite Unit(s) **4)**

components and equipment

Distribution Cable Jointing Pathway Group

Unit Code	Unit Title
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDRCJ21A	Lay ESI electrical cables
UETTDRCJ26A	Install and maintain de-energised low voltage underground polymeric cables.
UETTDRCJ27A	Install and maintain de-energised high voltage underground polymeric cables.
UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
UETTDRIS41A	Install network infrastructure electrical equipment
UETTDRIS42A	Maintain network infrastructure electrical equipment
UETTDRIS55A	Install and maintain low voltage underground services

Electrical Pathway Group

Unit Code	Unit Title
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical

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Prerequisite Unit(s) **4)**

	installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits
UEENEEK142A	Apply environmentally and sustainable energy procedures in the energy sector
UETTDRIS67A	Solve problems in energy supply network equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for the LV field switching to a given schedule	1.1	Switching and work schedule(s), including drawings, plans, requirements, established procedures, and material lists, are received, analysed and confirmed, if necessary, by site inspection.
	1.2	Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites.
	1.3	OHS policies and procedures related to requirements and established procedures for LV switching are obtained and confirmed for the purposes of the work to be performed and communicated.
	1.4	Work is prioritised and sequenced following consultation with others for completion within acceptable timeframes and in accordance with established procedures.
	1.5	Hazards are identified, OHS risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear according to established procedures.
	1.6	Relevant authority is obtained to perform work according to requirements and/or established procedures.
	1.7	Resources including personnel, equipment, tools and personal protective equipment required for the job are obtained and confirmed in working order.

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ELEMENT	PERFORMANCE CRITERIA	
	1.8	Relevant personnel at worksite are confirmed current in First Aid and other related work procedures according to requirements.
	1.9	Liaison and communication issues with other/authorised personnel, authorities, clients and land owners are resolved to carry out work where necessary.
	1.10	Site is prepared according to the work schedule and to minimise risk and damage to property, commerce, and individuals in accordance with established procedures.
	1.11	Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities confirmed where applicable in accordance with established procedures.
	1.12	Road signs, barriers and warning devices are positioned in accordance with requirements.
2 Carry out LV field switching to a given schedule	2.1	OHS and sustainable energy principles and practices to reduce the incidents of accidents and minimise waste are monitored and followed in accordance with requirements and/or established procedures.
	2.2	Lifting, climbing, working in confined spaces and aloft, and use of power tools/equipment, techniques and practices are safely followed and, currency according to requirements confirmed.
	2.3	Essential knowledge and associated skills in the safe LV field switching to a given schedule are applied to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements.
	2.4	Communications with Switching Control Officer are established and maintained throughout the isolation operation according to established procedures.
	2.5	Electrical equipment and associated circuits line/network or work site to be switched

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ELEMENT	PERFORMANCE CRITERIA	
		including paralleling is isolated and proved de-energised using appropriate devices and earthed where required according to requirements and established procedures.
	2.6	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported to the immediate authorised persons for directions according to established procedures.
	2.7	Unplanned events occurring during LV field switching to a given schedule are responded to and undertaken within the scope of established procedures.
	2.8	Known solutions to a variety of problems are applied using acquired essential knowledge and associated skills.
	2.9	Ongoing checks of quality of the work are undertaken in accordance with instructions and established procedures
3 Complete the LV field switching to a given schedule	3.1	Work undertaken is checked against works schedule for conformance with requirements and anomalies reported in accordance with established procedures.
	3.2	Accidents and/or injuries are reported in accordance with requirements/established procedures, where applicable.
	3.3	Work site is rehabilitated, cleaned up and made safe in accordance with established procedures.
	3.4	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.5	Relevant permit(s) are signed off, safety devices are removed, and the system is re-energised and returned to service in accordance with requirements/established procedures.
	3.6	Works completion records, reports, as installed /modified drawing and/or documentation and information are finalised and processed and

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ELEMENT	PERFORMANCE CRITERIA
	appropriate personnel and authority notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of performing high voltage field switching to a given schedule.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS43A LV Switching

Evidence shall show an understanding of LV system switching principles including switching authorisation procedures to an extent indicated by the following aspects:

T1 Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to system switching

T2 Requirements for the use of manuals, system diagrams/plans and drawings encompassing:

- Types, characteristics and capabilities of electrical apparatus
- Use, characteristics and capabilities of specialised tools and testing equipment
- LV network interconnectors for alternate sources of supply and possible backfeed.

T3 Procedures for obtaining correct LV switching authorisation encompassing:

- Identification of hazards, assessing and controlling risks
- Safety procedures and precautions
- Safe approach distances
- Responsibilities and protocols
- Identifying switching resources
- Procedures for obtaining electrical access permits/authorities
- Requirements for team switching
- Procedures for coordination of operations

T4 Techniques in LV system switching encompassing:

- Isolation procedures and proving dead
- Pre-switching checks
- Switching operational procedures
- Emergency fault procedures
- Energisation procedures

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all component parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET12". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of employability skills; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures; and
  - Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be**	**Item List**

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	demonstrated	
A	All of the following:	Approvals/clearances Access authority /permits
B	Any two of the following:	Voltage detectors Polarity testers Phase rotation indicators
C	Any one of the following:	LV links LV bridges LV fuses
D	At least one occasion:	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual performance of LV field switching to a given schedule.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

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Method of assessment

9.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this Competency Standard Unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall be demonstrated in relation to the conducting of low voltage switching operations involving the operation of circuit breaking and isolation devices from a given switching schedule as it relates to low voltage distribution systems in field situations but also includes paralleling in accordance with the switching schedule.

Operation of circuit isolation devices associated with energy reticulation systems/networks is confined to low voltage systems in field situations which are performed in accordance with a switching schedule and established procedures.

Switching Control Officer refers to an appropriate person designated as such by regulations, codes or enterprise arrangements who is responsible for coordinating and directing switching activities in consultation with field operatives.

Switchgear may include Low Voltage fuses, Low Voltage links and bridges.

Specialist tools and devices may include Low Voltage detectors, Low Voltage polarity testers and Low Voltage phase rotation indicators.

Switching program/schedule refers to structure, switch or equipment number; locations; Low Voltage distributor, spur or feeder; outage times; works order/plan

The following constants and variables included in the element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards

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RANGE STATEMENT

- Inspect
- Legislation
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Industry Specific Cross-Discipline Units

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UETTDRIS44A Perform HV field switching operation to a given schedule

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This Competency Standard Unit covers the carrying out of high voltage switching operations involving the operation of circuit breaking and isolation devices from a given switching schedule and according to enterprise procedures. It also encompasses the process of; communicating with the Switching Control Officer or Electrical Control Officer, isolating the electrical equipment and the line or work site, as well as proving that the area is de-energised and earthed, issuing/accepting electrical permits and the returning of the affected circuits to service.

Application of the Unit

Application of the Unit **2)**

This Competency Standard Unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a licence/registration to practice in the work place subject to regulations for undertaking of electrical work.

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License to practice **3)**

Practice in workplace and during training is also subject to regulations directly related to Occupational Health and Safety, electricity/telecommunications/gas/water industry safety and compliance, industrial relations, environmental protection, anti discrimination and training. Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Transmission Overhead

Distribution Overhead

Rail Traction

Distribution Cable Jointing

Electrical

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology

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Prerequisite Unit(s) **4)**

	equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UETTDREL16A	Working safely near live electrical apparatus

Transmission Overhead Pathway Group

Unit Code	Unit Title
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
UETTDRIS54A	Install and maintain poles, structures, overhead conductors and cables
UETTDRTP26A	Install transmission structures and associated hardware
UETTDRTP27A	Maintain transmission structures and associated hardware
UETTDRTP29A	Install and maintain transmission overhead conductors and cables

Distribution Overhead Pathway Group

Unit Code	Unit Title
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDRDP12A	Maintain overhead energised low voltage conductors and cables
UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus

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Prerequisite Unit(s) **4)**

UETTDRIS41A	Install network infrastructure electrical equipment
UETTDRIS42A	Maintain network infrastructure electrical equipment
UETTDRIS52A	Install and maintain poles, structures and associated hardware
UETTDRIS54A	Install and maintain poles, structures, overhead conductors and cables
UETTDRIS56A	Install and maintain low voltage overhead services

Rail Traction Pathway Group

Unit Code	Unit Title
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
UETTDRIS52A	Install and maintain poles, structures and associated hardware
UETTDRIS54A	Install and maintain poles, structures, overhead conductors and cables
UETTDRRT21A	Install traction overhead wiring systems
UETTDRRT22A	Maintain traction overhead wiring systems
UETTDRRT23A	Install rail traction bonds
UETTDRRT27A	Install overhead traction components and equipment
UETTDRRT28A	Maintain overhead traction components and equipment

Distribution Cable Jointing Pathway Group

Unit Code	Unit Title

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Prerequisite Unit(s) **4)**

UETTDRCJ21A	Lay ESI electrical cables
UETTDRCJ26A	Install and maintain de-energised low voltage underground polymeric cables.
UETTDRCJ27A	Install and maintain de-energised high voltage underground polymeric cables.
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
UETTDRIS41A	Install network infrastructure electrical equipment
UETTDRIS42A	Maintain network infrastructure electrical equipment
UETTDRIS55A	Install and maintain low voltage underground services

Electrical Pathway Group

Unit Code	Unit Title
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits

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Prerequisite Unit(s) **4)**

UEENEEK142A	Apply environmentally and sustainable energy procedures in the energy sector
UETTDRIS67A	Solve problems in energy supply network equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to undertake HV switching procedures to a given schedule	1.1	Switching and work schedule(s), including drawings, plans, requirements, established procedures, and material lists, are received, analysed and confirmed, if necessary, by site inspection.
	1.2	Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites.
	1.3	OHS policies and procedures related to requirements and established procedures for HV switching are obtained and confirmed for the purposes of the work to be performed and communicated.
	1.4	Work is prioritised and sequenced following consultation with others for completion within acceptable timeframes and in accordance with established procedures.
	1.5	Hazards are identified, OHS risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear according to established procedures.
	1.6	Relevant authority is obtained to perform work according to requirements and/or established procedures.
	1.7	Resources including personnel, equipment, tools and personal protective equipment required for the job are obtained and confirmed in working order.
	1.8	Relevant personnel at worksite are confirmed current in First Aid and other related work procedures according to requirements.
	1.9	Liaison and communication issues with other/authorised personnel, authorities, clients and land owners are resolved to carry out work where necessary.
	1.10	Site is prepared according to the work schedule

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ELEMENT	PERFORMANCE CRITERIA	
		and to minimise risk and damage to property, commerce, and individuals in accordance with established procedures.
	1.11	Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities confirmed where applicable in accordance with established procedures.
	1.12	Road signs, barriers and warning devices are positioned in accordance with requirements.
2 Carry out HV switching procedures to a given schedule	2.1	OHS and sustainable energy principles and practices to reduce the incidents of accidents and minimise waste are monitored and followed in accordance with requirements and/or established procedures.
	2.2	Lifting, climbing, working in confined spaces and aloft, and use of power tools/equipment, techniques and practices are safely followed and, currency according to requirements confirmed.
	2.3	Essential knowledge and associated skills are applied for the safe undertaking of HV switching procedures to a given schedule to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements.
	2.4	Communications with Switching Control Officer are established and maintained throughout the isolation operation according to established procedures.
	2.5	Electrical equipment and associated circuits line/network or work site to be switched including paralleling is isolated and proved de-energised using appropriate devices and earthed where required according to requirements and established procedures.
	2.6	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported to the immediate authorised persons for directions according to established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Unplanned events occurring during HV switching procedures to a given schedule are responded to and undertaken within the scope of established procedures.
	2.8	Relevant permits are prepared and issued in accordance with established procedures.
	2.9	Known solutions to a variety of problems are applied using acquired essential knowledge and associated skills.
	2.10	Ongoing checks of quality of the work are undertaken in accordance with instructions and established procedures.
3 Complete HV switching procedures to a given schedule	3.1	Work undertaken is checked against works schedule for conformance with requirements and anomalies reported in accordance with established procedures.
	3.2	Accidents and/or injuries are reported in accordance with requirements/established procedures, where applicable.
	3.3	Work site is rehabilitated, cleaned up and made safe in accordance with established procedures.
	3.4	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.5	Relevant permit(s) are signed off, safety devices are removed, and the system is re-energised and returned to service in accordance with requirements/established procedures.
	3.6	Works completion records, reports, as installed /modified drawing and/or documentation and information are finalised and processed and appropriate personnel and authority notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of performing high voltage field switching to a given schedule.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS44A High voltage switching

Evidence shall show an understanding of high voltage switching principles to an extent indicated by the following aspects:

T1 Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching of high voltage to a given schedule

T2 Requirements for the use of manuals, system diagrams/plans and drawings encompassing:

- Types, characteristics and capabilities of electrical apparatus
- Use, characteristics and capabilities of specialised tools and testing equipment
- Network interconnectors source of possible backfeed

T3 Role of the HV switching operator

T4 Procedures for obtaining correct HV switching authorisation encompassing:

- Identification of OHS hazards, assessing and controlling risks
- Safety procedures and precautions
- Safe approach distances
- Responsibilities and protocols
- Identifying switching resources
- Procedures for obtaining electrical access permits/authorities
- Requirements for team switching
- Procedures for coordination of operations

T5 Use and operation of equipment associated with HV overhead and substation equipment encompassing:

- Test instruments
- Sticks
- Interrupters
- Arc stranglers

T6 Operation of protection systems and substation equipment

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REQUIRED SKILLS AND KNOWLEDGE

- Note: Examples include fault levels and settings; types and applications; protection systems and substation equipment fault levels and settings; types and applications

T7 Types and categories of HV switchgear

T8 Application, function and operating capabilities of switchgear

T9 Restrictions pertaining to HV switching equipment

T10 Procedures for the isolation of HV transmission main and working earths

T11 Earthing HV electrical apparatus practices and procedures for access encompassing:

- Purposes of Operational and additional work part - on-site earths
- Factors determining the location and effectiveness of Operational earthing
- Acceptable industry procedures
- Personal protective equipment

T12 High voltage switching techniques

- Pre-switching checks
- Switching operational procedures
- Isolation procedures and proving dead/de-energised
- Earthing procedures
- Pre-switching checks
- Switching operational procedures
- Emergency fault procedures
- Energisation procedures

T13 Application and function of SWER system components

- Circuit arrangement
- Principle of operation
- Hazards and procedures associated with faulty SWER earth systems
- Procedure to isolate, energise and commission SWER substations

T14 Operation of HV overhead switching or indicating devices encompassing:

- Identifying hazards, assessing and controlling risks associated with HV switchgear operation
- Systematic and defensive techniques
- Mobile radio procedures
- Double isolation procedures
- Note: Examples include fuses; disconnect fuses; load switching; live line

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REQUIRED SKILLS AND KNOWLEDGE

indicators; capacitors; reclosers; sectionalisers, underslung links, airbreaks; switches, disconnects; live line clamps; phasing sticks; phasing tester

KS02-TIS44A High voltage fault switching principles

Evidence shall show an understanding of high voltage fault switching principles to an extent indicated by the following aspects:

T1 Primary causes, effects and types of HV electrical faults

T2 HV protection devices encompassing:

- Main components
- Types
- Categories
- Applications
- Functions

T3 Basic principle of operation of HV system protection devices

T4 Protection co-ordination and protection —zoning

T5 HV feeder auto-reclosing suppression encompassing:

- Function
- Application

T6 Circuit condition requirements and switching considerations when paralleling and separating HV feeders

KS03-TIS44A High voltage distribution transformer principles

Evidence shall show an understanding of high voltage distribution transformer principles to an extent indicated by the following aspects:

T1 Operation of HV distribution transformers encompassing:

- Principle governing factors for transformer ratings
- Protection and alarms
- Operating limitations and the relationship between transformer and HV fuse rating
- Purpose and principle operation of HV distribution transformer tap changers
- HV distribution transformer and transformer — cable combination switching practices
- Paralleling requirements
- Isolation and earthing procedures for access
- Common distribution transformer and associated electrical apparatus faults

T2 HV underground switching equipment

- Note: Examples include arc stranglers, switch operation, load break elbows, switching cubicles, canister fuses, bayonet fuses, F and G switching cubicles, voltage indicators and phasing testers

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REQUIRED SKILLS AND KNOWLEDGE

KS04-TIS44A Feeder automation system

Evidence shall show an understanding of feeder automation system to an extent indicated by the following aspects:

T1 Function of feeder automation system and the main components

T2 Operation procedure for a remote field device from a local control station

T3 Functions of —System Control and Date Acquisition (SCADA) (or any other relevant Data Acquisition and Control) systems and its main components

T4 SCADA system security interlocks and access restrictions

T5 SCADA system operation when switching apparatus or retrieving data via a remote access device such as; Remote Access Terminal (RAT), Dial Up Voice Annunciate System and Local Control Station

T6 Function of the main components of a local/remote control system

T7 Operation of a field devices using SCADA systems via a Remote Access Terminal (RAT), Dial Up Annunciate System and Local Control Station

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

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Overview of Assessment **9.1)**

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recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET12". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
    - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and

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range; and

- Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
- Demonstrate an appropriate level of employability skills; and

- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures; and
  - Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	All of the following:	Approvals/clearances Access permits
B	All of the following:	HV operating sticks HV operating earths HV detectors
C	At least one of the following:	HV phasing sticks HV ground mounted equipment isolating handles and earths
D	At least two of the following:	HV links Air break switches Fuses
E	At least three of the following:	Reclosers Ring main units

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		Circuit breakers Isolators Earth switches Sectionalisers
F	At least one occasion:	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual performance of HV field switching to a given schedule.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

9.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this Competency Standard Unit applies. This requires that the specified essential knowledge and

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associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall be demonstrated in relation to the carrying out of high voltage switching operations involving the operation of circuit breaking and isolation devices from a given switching schedule.

Switching operations are confined to those performed in field situations, not in system control rooms or substations and may include electrical load transfer.

Switchgear includes reclosers, ring main units, circuit breakers, isolators, earth switches, sectionalisers, HV links, air break switches, live line clamps, and fuses.

Specialist tools may include HV phasing sticks, HV link sticks, HV live-line clamp operating sticks, HV ground transformer isolating handles and associated earths, HV overhead operating earths and HV detectors.

Switching program/schedule including necessary detail, e.g. structure, switch or equipment number; locations; HV feeder; outage times; works plan/order;

The following constants and variables included in the element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards

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RANGE STATEMENT

- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Industry Specific Cross-Discipline Units

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UETTDRIS47A Sample, test, filter and reinstate insulating oil

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This Competency Standard Unit covers the filtering, sampling, testing and reinstating of insulating oil. This may include the dispatching of oil samples to a laboratory for higher level testing if required. Post operational servicing of equipment and or plant and, the identification of any related environment issues concerning disposal, safety and the like are also associated with this unit.

Application of the Unit

Application of the Unit **2)**

This Competency Standard Unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit requires a licence/registration to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to Occupational Health and Safety, electricity/telecommunications/gas/water industry safety and compliance, industrial relations, environmental protection, anti discrimination and training.

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License to practice **3)**

Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG101A	Solve problems in electromagnetic

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Prerequisite Unit(s) **4)**

	devices and related circuits
UEENEEG102A	Solve problems in electromagnetic devices and related circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEK142A	Apply environmentally and sustainable energy procedures in the energy sector
UETTDREL16A	Working safely near live electrical apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	3	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to sample, test, filter and reinstating insulating oil	1.1	Works schedule(s), including drawings, plans, requirements, established procedures, and material lists, are received, analysed and confirmed, if necessary, by site inspection.
	1.2	Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites.
	1.3	OHS policies and procedures related to requirements and established procedures for sampling, testing, filtering and reinstating insulating oil are obtained and confirmed for the purposes of the work to be performed and communicated.
	1.4	Work is prioritised and sequenced following consultation with others for completion within acceptable timeframes and in accordance with established procedures.
	1.5	Hazards are identified, OHS and environmental risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear according to established procedures.
	1.6	Relevant work permits are obtained to access and perform work according to requirements and/or established procedures.
	1.7	Resources including personnel, equipment, tools and personal protective equipment required for the job are obtained and confirmed in working order.

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ELEMENT		PERFORMANCE CRITERIA	
		1.8	Relevant personnel at worksite are confirmed current in rescue, release, CPR, pole top rescue and other related work procedures according to requirements.
		1.9	Liaison and communication issues with other/authorised personnel, authorities, clients and land owners are resolved to carry out work where necessary.
		1.10	Site is prepared according to the work schedule and to minimise risk and damage to property, commerce, and individuals in accordance with established procedures.
		1.11	Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities confirmed where applicable in accordance with established procedures.
		1.12	Traffic management plan is identified and implemented.
2	Carry out sampling, testing, filtering and reinstating of insulating oil	2.1	OHS, sustainable energy and environmental principles and practices to reduce the incidents of accidents and minimise waste are monitored and followed in accordance with requirements and/or established procedures.
		2.2	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported to the immediate authorised persons for directions according to established procedures.
		2.3	Lifting, climbing, working in confined spaces and aloft, and use of power tools/equipment, techniques and practices are safely followed and, currency according to requirements confirmed.
		2.4	Essential knowledge and associated skills are applied for the safe sampling, testing, filtering and reinstating of insulating oil are applied to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste

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ELEMENT	PERFORMANCE CRITERIA	
		according to requirements.
	2.5	Sampling, testing, filtering and reinstating of the insulating oil is carried out, in accordance with the work schedule and to requirements and or established procedures.
	2.6	Unplanned events in the filtering, sampling and testing of insulating oil are undertaken within the scope of established procedures.
	2.7	Known solutions to a variety of problems are applied using acquired essential knowledge and associated skills.
	2.8	Ongoing checks of quality of the work are undertaken in accordance with instructions and established procedures.
3 Complete the sampling, testing, filtering and reinstating of insulating oil	3.1	Work undertaken is checked against works schedule for conformance with requirements and anomalies reported in accordance with established procedures.
	3.2	Accidents and/or injuries are reported in accordance with requirements/established procedures, where applicable.
	3.3	Work site is rehabilitated, cleaned up and made safe in accordance with established procedures.
	3.4	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage or disposed of in accordance with established procedures.
	3.5	Relevant work permit(s) are signed off and, equipment is returned to service in accordance with requirements.
	3.6	Works completion records, reports, as installed /modified drawing and/or documentation and information are finalised and processed and appropriate personnel notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of sampling, testing, filtering and reinstatement of insulating oil.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS47A Insulating oil - sample, test, filter

Evidence shall show an understanding of the sampling, testing and filtering insulating oil to an extent indicated by the following aspects:

T1 Filtering and sampling of insulating oil encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with filtering and sampling such as - safe handling procedures, personal hygiene, storage and disposal procedures, Occupational Health and Safety hazards and precautions including use of appropriate personal protective equipment, environmental procedures, effects of contaminates.
- Properties of insulating oil - dielectric strength, moisture content, acidity, sludge.
- Locations where insulating oil is used - transformer, switchgear and oil filled cable.
- Filtering equipment – types, cleaning procedures, method of use.
- Techniques in filtering and sampling insulating oil - methods of sampling, methods of filtering, testing procedures on site, analysing oil effectiveness.
- Frequency of testing

T2 Testing of insulating oil encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements associated with testing such as - precautions during testing, types of testing equipment,
- Techniques in testing insulating oil - electric strength, water content, dielectric dissipation, resistivity, acidity
- Brief introduction to Dissolved Gas Analysis(DGA)

T3 Powerline safety practices encompassing:

- Protective apparatus and apparel for linework - responsibilities for the selection, use, maintenance and storage of protective apparatus and apparel and the types of protective apparatus and apparel used for the line worker
- Requirements for the use of ladders - carrying, erecting, collapsing and lowering different types of extension ladder against a standing pole, maintenance checks on different types of ladders, renewal of extension ropes and the safety issues relating to clearances from overhead conductors
- Requirements for climbing and working aloft - methods used to identify a pole is safe to climb, methods used to inspect a line worker’s body belt, application of

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REQUIRED SKILLS AND KNOWLEDGE

knots and hitches appropriate to the requirements of a line worker, height safety principles including personal fall protection, prevention and related requirements, and the practical procedure of climbing an overhead structure and fitting a pole chair

- Traffic management - purpose of traffic management and a line worker's responsibilities in accordance with relevant statutory requirements and electricity supply industry requirements, demonstration of the procedure used to provide an effective traffic management scheme and the use of a two-way radio
- Control of small fires - identification, selection and operation of the appropriate extinguishing mediums for various types of fires, general fire prevention methods and the precautions for personal protection when fighting small fires
- Rescue victims from heights and confined spaces - planning, identifying, the procedures, and establishing responses, developing techniques, involvement of external emergency services and practical demonstration/rehearsals of rescuing a person from heights and from confined spaces and emergency procedures for the rescue of an electric shock victim including CPR
- Requirements for aerial linework - planning, establishing and implementing relevant aviation authority clearances, determining system requirements, aircrew familiarisation with network operations and equipment, requirements for effective communications operations for aerial work.

T4 Material handling and the environment encompassing:

- Methods of obtaining updated environmental information and data sheets on the proper use and handling of equipment and materials
- Environmental standards, codes, environmental legislation, OHS legislation, hazardous substances/dangerous goods regulations, supply authority regulations and or enterprise requirements applicable environmental care when handling materials including provision of manufacturers and suppliers information such as material safety data sheets (MSDS)
- Types and application of personal protective equipment used for hazards substances
- Types and application of personal protective equipment used for hazards substances and dangerous goods
- Techniques in handling equipment to eliminate/reduce risks to the environment from spillages of oils, herbicides, pesticides and chemicals from such equipment - vehicle loading crane, chainsaw, enterprise vehicles, explosive power tools
- Procedures for handling and control of spillages of herbicides
- Methods of disposing and storage of herbicides, pesticides and chemicals
- Methods of cleaning mobile plant, equipment and tools
- Recording of data

T5 Environmental issues when undertaking sampling and filtering of oil encompassing:

- Environmental standards, codes, environmental legislation, supply authority regulations and or enterprise requirements applicable to the work to be undertaken

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REQUIRED SKILLS AND KNOWLEDGE

- Methods of obtaining updated environmental information and data sheets on the proper use and handling of oil used on transformers and switchgear including provision of MSDS
- Techniques in filtering and sampling oil to eliminate/reduce risks to the environment from spillages
- Safety procedures and equipment for handling and control of the oil
- Methods of disposing and storage of the oil
- Methods of cleaning equipment, tools and equipment
- Emergency procedures for spillages of oil to reduce risks to the environment - methods of cleaning up excessive spillages, methods of protection to surrounding environment, procedure for notification of relevant personnel and authorities, recording procedures.
- PCB contamination, handling and disposal procedures

T6 Safe handling and/or disposing of insulation materials used in power distribution devices, which are potential environmental pollutants encompassing:

- Standards, codes, Commonwealth, State/Territory and local government legislation, supply authority regulations and or enterprise requirements applicable to the handling and disposing of insulation or heat dissipation materials used in power distribution devices
- Identification of environmental issues associated with the handling and disposing of insulation materials
- Safety precautions when handling and disposing of heat dissipation materials
- Safe working practices
- Occupational Health and Safety hazards and precautions
- Identification of hazards, assessing and controlling risks
- Types, selection, maintenance and uses of personnel protective equipment
- Permit to work systems and isolation procedures
- Types and function of specialised equipment
- Safe working practices when using specialised equipment
- Emergency response and rescue including First Aid etc
- Techniques in the handling and disposing of insulation materials - Polychlorinated Bi-Phenyls (PCB’s), asbestos, insulating Oil, SF6 gas.

T7 Enterprise specific — policy and procedure instructions encompassing:

- Responsibilities and duty of care of employer and employee relationship
- Methods of obtaining the up-to-date information on enterprise policy and procedures
- Rules and regulations
- Induction into workplace - location of work area and storage area, timetable, uniform, personal well-being, housekeeping rules, emergency procedures, evacuation procedures
- Techniques when deal with others - working in teams, customer relation,

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REQUIRED SKILLS AND KNOWLEDGE

complaint and issues procedures.

- Overview of enterprise professional development - fire fighting procedures, fatigue management, training and competency development - understanding and promotion

T8 Enterprises specific — OHS instructions encompassing:

- Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the OHS policies and procedures
- Methods of obtaining the up-to-date information on enterprise OHS policy and procedures
- Specific enterprise personal protection equipment - type and application, where and when to be used, method of replacement, responsibility of maintenance including cleaning inspection and testing, emergency response, rescue, evacuation and First Aid procedures
- Personal well-being – hygiene, fatigue/stress management, drugs/alcohol
- OHS training - induction training, specific hazard training, specific task or equipment training, emergency and evacuation training, training as part of broader programs such as equipment operation
- OHS records including audits, inspection reports, workplace health and environmental monitoring records, training and instruction records, manufacturers and suppliers information such as MSDSs, registers, maintenance reports, workers compensation and rehabilitation records and First Aid/medical records

T9 Enterprises specific — technical drawing and documents encompassing:

- Types and application of enterprise specific drawings and documents - electrical and electronic drawings, mechanical drawings, project charts, schedules, graphs, technical manuals and catalogues
- Instruction/worksheets sheets - types and application of enterprise specific symbols and diagrams
- Title box - description of parts and version control

T10 Enterprises specific specialised tools encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the use and care of specialised tools - voltage detectors; polarity testers, phase rotation.
- Characteristics, capabilities and application of specialised tools for a particular job
- Safety policies, procedures and precautions with regards to using, transporting and storage of specialised tools
- Selection methods for obtaining the correct specialised tool for the particular job including during procurement, purchasing and or hiring arrangements
- Techniques in pre-use inspection on the serviceability of specialised tools
- Techniques in the selection, use, maintenance, and care and storage of specialised tools
- Identifying OHS hazards, assessing and controlling risks associated with their use

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REQUIRED SKILLS AND KNOWLEDGE

- Techniques for the safe use of specialised power tools

T11 Substation safety practices encompassing:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements pertaining to substation safety practices
- Techniques in the use of protective apparatus and apparel for substations work, including responsibilities with regard to the use and maintenance of protective apparatus and apparel and the types of protective apparatus and apparel used for work in substations
- Requirements for the use of ladders and appropriate ladder types for work in substations - safe work methods when carrying, erecting, collapsing and lowering different types of extension ladder against substation structures, plant and equipment, maintenance checks on different types of ladders, renewal of extension ropes and the safety issues relating to clearances from energised conductors
- Requirements for climbing and working at heights in substations - attached climbing principles, selection, use and operation of elevated work platforms and any OHS requirements associated with the use of EWPs
- Control of small fires - identification, selection and operation of the appropriate extinguishing mediums for various types of fires and the precautions for personal protection when fighting small fires
- Control of oil spills - identification, use and maintenance of spill oil control equipment and materials, oil containment facilities and systems
- Rescue and release procedures - rescue personnel from energised conductors, emergency descent from an EWP and may include rescue from confined spaces
- Enterprise requirements - safe access and Authorisation to Work procedures, use of mobile extendable equipment on or near energised HV conductors, emergency response procedures, hazards associated with work in substations including earthing systems, transfer potentials, step and touch effects, electrostatic and electromagnetic induction, dangers of near approach to energised conductors.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all component parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET12". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of employability skills; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures; and
  - Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be**	**Item List**

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	demonstrated	
A	At least two of the following:	Tx Main Tank. Tx Tap Changer Switchgear Cable Reactor
B	At least one occasion:	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual sampling, testing, filtering and reinstatement of insulating oils.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

9.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

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Note:

Competent performance with inherent safe working practices is expected in the Industry to which this Competency Standard Unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall be demonstrated in relation to the filtering, sampling and testing of transformers, switchgear and cable insulating oil and may include tests for dielectric strength and moisture.

Equipment may include (pump) filter press, hoses, pipes, soil kits, sample bottles, storage vessels etc.

The following constants and variables included in the element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work

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RANGE STATEMENT

- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Industry Specific Cross-Discipline Units

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UETTDRIS67A Solve problems in energy supply network equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers determining correct operation of energy supply network electrical equipment and providing solutions as they apply to energy supply network electrical equipment.. It encompasses working safely, reading circuit and reticulation diagrams, applying logical problem solving processes from measurements and completing the necessary documentation.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired and is therefore not applicable to those entering work.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Prerequisite Unit(s) **4)**

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to solve problems in energy supply network equipment.	1.1 OHS procedures for a given work area are identified, obtained and understood.
	1.2 OHS risk control measures and procedures in preparation for the work are followed.
	1.3 The likely extent of work to be undertaken is envisaged from reports and/or discussions with appropriate person(s).
	1.4 Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5 Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6 Tools, equipment and testing devices needed to take measurements are obtained in accordance with established procedures and checked for correct operation and safety.
2 Solve problems in energy supply network equipment.	2.1 OHS risk control measures and procedures for carrying out the work are followed.
	2.2 The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.4	Safety hazards resulting from the reports and risk control measures devised and implemented in consultation with appropriate personnel.
	2.5	Problem solving is approached methodically drawing on knowledge of energy network equipment using measured and calculated values of circuit/apparatus parameters.
	2.6	Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage
	2.7	Circuits/components are rechecked and their operational status is confirmed.
	2.8	Materials/replacement parts required to solve problems are sourced and obtained in accordance with established procedures.
	2.9	Effectiveness of the repair is tested in accordance with established procedures.
	2.10	Apparatus is reassembled, finally tested and prepared for return to service.
	2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.12	Problem solving activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Completion and report for problem solving in energy supply network equipment	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.
	3.3	Maintenance work activities are documented in accordance with established procedures. Note. Examples of documentation are component, test results, authorisations, permits, and

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ELEMENT	PERFORMANCE CRITERIA
	parts/component dispatch and stores records.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in energy supply network equipment in energy supply network equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS67A Electricity supply and reticulation

Evidence shall show an understanding of electricity supply and reticulation systems to an extent indicated by the following aspects:

T1 Generation encompassing:

- primary energy sources
- power stations
- power station output
- acts and legislation relating to generation
- renewable energy sources and techniques

T2 Transmission encompassing:

- system requirements
- principal components of a power system
- voltage levels
- grid systems
- acts/legislation relating to transmission
- future trends

T3 Distribution encompassing:

- high voltage distribution systems
- medium/low voltage distribution systems
- radial feeders
- parallel feeders
- ring main feeders
- acts/legislation relating to distribution

T4 Substations encompassing:

- purpose
- location
- layout

T5 Overhead and underground systems encompassing:

- relative merits

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REQUIRED SKILLS AND KNOWLEDGE

- applications
- planning
- installation

T6 Power distribution system electrical characteristics encompassing:

- transmission and distribution systems
- inductance, capacitance and resistance

T7 Voltage problems in a power distribution system encompassing:

- low voltage
- unbalanced voltages
- voltage rises

T8 Voltage regulation encompassing:

- autotransformers with OLTC
- transformers with OLTC
- static capacitors
- load control

T9 Control of OLTC encompassing:

- regulation relays
- control circuits
- line drop compensation

T10 Power distribution system faults encompassing:

- type/classification of fault
- typical causes/effects of faults
- three-phase symmetrical fault levels
- fault level limitation

T11 Voltage surges in a power distribution system encompassing:

- lightning surges
- switching surges
- typical surge levels
- surge impedance, typical values
- significance of the system surge impedance.

T12 Metering and metered quantities encompassing:

- purpose
- energy
- maximum demand
- accuracy classes for metering systems

T13 Energy and demand meters encompassing:

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REQUIRED SKILLS AND KNOWLEDGE

- construction
- operation
- adjustments
- testing

T14 Metering circuits encompassing:

- direct metering
- instrument transformer metering

T15 Electronic metering systems and recording meters encompassing:

- types
- applications
- connections

T16 Load control encompassing:

- purpose
- methods

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full

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can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UET12'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement

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  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solving problems in energy supply network equipment as described as described in 8) and including:

A Determining the operating parameters of existing energy supply equipment.

B Envisaging the likely extent of work from reports and discussion with appropriate person(s).

C Using methodical problem solving techniques.

D Solving problems efficiently.

E Altering an existing energy supply equipment to comply with specified operating parameters.

F Developing energy supply equipment to comply with a specified function and operating parameters.

G Determining conditions causing an existing energy supply equipment to be unsafe.

H Completing documentation correctly.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in energy supply network equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency

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development in this unit may be arranged concurrently with unit:

UEENEEG006A	Solve problems in single and three phase low voltage machines

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by solving problems in energy supply network equipment in:

At least one of energy supply network systems:

- distribution overhead system;
- distribution underground system;
- transmission overhead system;
- transmission underground system.

and

At least three of the following distribution/transmission equipment:

- voltage regulation equipment
- on load tap changers
- energy metering
- demand meters
- load control
- current transformers
- potential transformers

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

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Competency Field

Competency Field **11)**

Industry Specific Cross-Discipline Units

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UETTDRIS68A Solve problems in energy supply network protection equipment and systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers determining correct operation of energy supply network protection equipment and systems and providing solutions as they apply to energy supply network protection. It encompasses working safely, reading circuit and reticulation diagrams, applying logical problem solving processes from measurements and completing the necessary documentation.

Application of the Unit

Application of the Unit

2)

This unit is intended as an additional competency to relevant competencies previously acquired and is therefore not applicable to those entering work.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Note:

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License to practice **3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications

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Prerequisite Unit(s) **4)**

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UETTDRIS67A	Solve problems in energy supply network equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to solve problems in energy supply network protection equipment and systems.	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The likely extent of work to be undertaken is envisaged from reports and/or discussions with appropriate person(s).
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to take measurements are obtained in accordance with established procedures and checked for correct operation and safety.
2	Solve problems in energy supply network protection equipment and systems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.

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ELEMENT		PERFORMANCE CRITERIA	
		2.4	Safety hazards resulting from the reports and risk control measures devised and implemented in consultation with appropriate personnel.
		2.5	Problem solving is approached methodically drawing on knowledge of energy supply network protection equipment and systems using measured and calculated values of circuit/apparatus parameters.
		2.6	Circuit/apparatus/system components are dismantled where necessary and parts stored to protect them against loss or damage
		2.7	Circuits/components/systems are rechecked and their operational status is confirmed.
		2.8	Materials/replacement parts required to solve problems are sourced and obtained in accordance with established procedures.
		2.9	Effectiveness of the repair is tested in accordance with established procedures.
		2.10	Apparatus is reassembled, finally tested and prepared for return to service.
		2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.12	Problem solving activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3	Completion and report for problem solving in energy supply network protection equipment and systems	3.1	OHS work completion risk control measures and procedures are followed.
		3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.
		3.3	Maintenance work activities are documented in accordance with established procedures.
			Note.

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ELEMENT	PERFORMANCE CRITERIA
	Examples of documentation are component, test results, authorisations, permits, and parts/component dispatch and stores records.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving problems in energy supply network protection equipment and systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS68A Electrical power system protection

Evidence shall show an understanding of protection methods and devices for electrical power systems to an extent indicated by the following aspects:

T1 Protection fundamentals encompassing:

- purpose of protection
- features of a protection scheme

T2 Instrument transformers for protection encompassing:

- Operating principles
- Applications of current transformers
- Applications of voltage transformers

T3 Feeder protection encompassing:

- fuse protection
- overcurrent & earth fault
- sensitive earth fault
- unit schemes
- distance protection
- trip/close sequences for feeders
- recloser/sectionaliser systems

T4 Transformer protection encompassing:

- overheating protection
- overcurrent protection
- restricted earth fault protection
- differential protection
- oil and gas devices

T5 Busbar protection encompassing:

- types of fault
- requirements of busbar protection
- system protection
- frame-earth protection

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REQUIRED SKILLS AND KNOWLEDGE

T6 Surge protection encompassing:

- voltage surges
- surge diverters
- arcing horns

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to

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be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UET12'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

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- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solving problems in energy supply network equipment as described as described in 8) and including:

A Determining the operating parameters of existing energy supply protection equipment and systems.

B Envisaging the likely extent of work from reports and discussion with appropriate person(s).

C Using methodical problem solving techniques.

D Solving problems efficiently.

E Altering an existing energy supply protection equipment to comply with specified operating parameters.

F Developing energy supply protection equipment to comply with a specified function and operating parameters.

G Determining conditions causing an existing energy supply protection equipment to be unsafe.

H Completing documentation correctly.

I Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.

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- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in energy supply network protection equipment and systems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UETTDRIS67A Solve problems in energy supply network equipment

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by solving problems in energy supply network protection equipment and systems in:

At least one of energy supply network systems:

- distribution overhead system;
- distribution underground system;
- transmission overhead system;
- transmission underground system.

and

At least two of the following protection equipment and systems

- over-current protection
- earth fault protection
- differential protection
- oil and gas devices
- busbar protection
- surge protection
- conventional relays
- electronic relays
- reclosers / sectionalisers

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Industry Specific Cross-Discipline Units

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UETTDRIS69A Diagnose and rectify faults in energy supply apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers diagnosing and rectifying faults in apparatus in energy supply and distribution systems. The unit encompasses safe working practices, interpreting diagrams and technical data, applying knowledge of energy supply apparatus to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology

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Prerequisite Unit(s) **4)**

	equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UETTDRIS67A	Solve problems in energy supply network equipment
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged

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Employability Skills	**5)**
	will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
		1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
		1.3	Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
		1.4	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel
		1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
		1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2	Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in

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ELEMENT	PERFORMANCE CRITERIA	
		strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Logical diagnostic methods are applied to diagnose energy supply apparatus faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Cause of the faults are identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system.
	2.7	Faults in the apparatus components are rectified to raise energy supply apparatus to its operation standard.
	2.8	Apparatus is tested to verify that it operates as intended and to specified requirements
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in energy supply apparatus.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS69A Electrical power system operations

Evidence shall show an understanding of electrical power system operations to an extent indicated by the following aspects:

T1 Control of voltage encompassing:

- Conditions leading to voltage collapse and system disintegration.
- Effects on the system of high/low volts
- Voltage control devices - voltage regulators applied to generators and synchronous phase modifiers, electromagnetic voltage regulators, series and parallel capacitors, OLTC transformers and static Var compensations (SVCs) such as saturated reactor compensations (SRs), thyristor controlled reactor compensators (TCRs), combined TCR/TSCs and the production of wave-form distorting harmonics and control devices.

T2 The importance of the location in the system of voltage control devices.

T3 The use of graphical methods to calculate the size of VAr regulating plant.

T4 Control of power encompassing:

- Base load and spinning reserve
- Regulating machines
- Rapid start plant,
- Phase shifting transformers and various forms of load shedding.
- Principles and practices of automated control of individual machines
- Stations and transmission/tie-line elements.
- Synchronising power

T5 The relationship between power and frequency encompassing:

- Limiting values
- Machine stabilising - steam by-pass, rapid valving, slip stabilisers and over speed limiting.
- Use of single pole generator CB's.
- Use of machine AVR's as angular stabilisers.
- Damped and un-damped system oscillations.
- Relationship between fault clearance times and system stability.
- Calculation of critical clearance angles based on equal area criteria.

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REQUIRED SKILLS AND KNOWLEDGE

T6 Types of communication systems encompassing:

- Telephone, power line carrier, dedicated cable, microwave links and fibre optics.
- Quantities and signals to be communicated.
- Advantages and disadvantages of the various systems.
- Equipment requirements.

T7 Transient over-voltages in power systems encompassing:

- Switching and lightning overvoltages and their effect on different plant items.
- Transient over-voltage control and reduction using surge diverters, shield wires and CB are control.
- Insulation systems, insulation coordination, insulation grading in plant items, bushings and capacitor bushings.

T8 Factors leading to the generation of corona encompassing:

- Consequences of corona.
- Reduction of corona
- Conductor bundling, grading rings and conductor surface treatment.

T9 Power System Protection encompassing:

- Location of CT's in major plant items.
- Earthing principles and devices.
- Fault current control/limitation using neutral earthing compensators (NEC's), neutral point earth impedances, high conductivity shield wires and parallel feed interlocking.
- Application of different types of protection.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UET12'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnosing and rectifying faults in energy supply apparatus as described in 8) and including:

    A Applying logical diagnostic methods.

    B Using fault scenarios to test the cause of system faults.

    C Identifying faults and competency needed to rectify them.

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D Rectifying faults in system controls.

E Verifying that the system operates correctly.

F Documenting fault rectification.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in energy supply apparatus.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in UEENEEE101A and other discipline specific occupational health and safety unit(s) shall be reassessed in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to diagnosing and rectifying at least four faults a control energy supply apparatus.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UETTDRIS70A Diagnose and rectify faults in electrical energy distribution systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers diagnosing and rectifying faults in networks supplying electrical energy to consumers. The unit encompasses safe working practices, interpreting diagrams and technical data, applying knowledge of energy supply and reticulation systems to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits

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Prerequisite Unit(s) **4)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UETTDRIS67A	Solve problems in energy supply network equipment
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct

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ELEMENT	PERFORMANCE CRITERIA	
		operation and safety.
2 Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Logical diagnostic methods are applied to diagnose energy supply apparatus faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system.
	2.7	Faults in the apparatus components are rectified to raise energy supply apparatus to its operation standard.
	2.8	System is tested to verify that it operates as intended and to specified requirements
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using

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ELEMENT	PERFORMANCE CRITERIA	
		sustainable energy practices.
3 Complete and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in electrical energy distribution systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS70A Electrical power distribution systems diagnostic

Evidence shall show an understanding of diagnosing faults in power distribution systems to an extent indicated by the following aspects:

T1 Distribution system overview including encompassing:

- regulatory conditions of supply and utilisation
- compliance with Australian Standards.
- reticulation system including overhead/underground, urban/rural, HV customers and high-rise building systems. The effects of industrial customers
- methods used to ensure continuity of supply.
- types of substations in current use.
- systems of distribution used, (primary and secondary)
- voltage levels, power factor, wave-form distortion and transient loading
- supply quality
- load curve profiles (residential/industrial/commercial)
- types of feeders
- distribution systems (urban, rural single-phase systems, SWER, spur, parallel and ring systems etc.)

T2 Overhead lines and installation encompassing:

- industry and safety regulations
- overhead conductors
- conductor material
- current rating factors (heating, voltage drops, power losses)
- aerial bundled cables (HV and LV)
- covered conductors - characteristics of lines and cables including the calculation of R, X and B for different arrangements of conductor. Typical values for actual lines. Transposition. Models based on line length. Voltage and line regulation
- overhead line poles
- types (wood, concrete and steel)
- installation of poles (tooling, rake, life, labelling, sinking)
- maintenance of poles – above & below ground
- pole strength and loads
- crossarms

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REQUIRED SKILLS AND KNOWLEDGE

- types and standard sizes
- insulators
- insulation types
- types (pin, suspension or disc, shackle)
- creepage, necessary clearances
- arcing horns, insulator mounting
- structure types
- mechanical properties (working strength, maximum tension, limiting size)
- interpretation of stringing charts
- determination of sag (by calculations or measurement and/or tension measurement)
- sight and wave sagging, sag correction
- stays
- components, anchorage

T3 Use of design schedules encompassing:

- sample design problems - common design practice line, voltage, structure types used, line deviation, span sag, crossarms, insulators and stays wind loading and line deviation loading basic surveying
- measurement of levels, deviation angle and compass bearings
- perform survey of short distribution line extension of produce field notes

T4 Underground cables encompassing:

- cable types, ratings, core material, design considerations, cable dielectrics, insulating materials and abbreviations, electric stress, cable volt drop and volt drop calculations, cable termination, joints and installation.
- induction and eddy currents
- cable testing, cable fault location
- cable drawing

T5 Voltage regulations of feeders and associated equipment encompassing:

- terminology used: distribution system, service line, customer’s terminals, customer voltage, utilisation voltage, base voltage, voltage variation and bandwidth
- voltage limits and effects of voltage variation
- causes of variation: inductance, capacitance and reactance of distribution lines, transformers
- methods of voltage control: off-load, on-load tap changers, voltage regulating relays, line drop compensation, different types of voltage regulators
- voltage profiles: principles, effect on voltage profiles, limits of voltage, voltage drops due to LV mains transformers, tapsettings feeder and service lines
- determining volt drops for components within the profile.

T6 Control of voltage. Conditions leading to voltage collapse and system

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REQUIRED SKILLS AND KNOWLEDGE

disintegration. Effects on the system of high/low volts. Voltage control devices including encompassing:

- voltage regulators applied to generators and synchronous phase modifiers
- electromagnetic voltage regulators
- series and parallel capacitors
- OLTC transformers and static Var compensations (SVCs)

T7 Range of devices covered by SVCs including encompassing:

- saturated reactor compensations (SRs)
- thyristor controlled reactor compensators (TCRs)
- combined TCR/TSCs and
- production of wave-form distorting harmonics and control devices

T8 Importance of the location in the system of voltage control devices.

T9 Types of communication systems including telephone, power line carrier, dedicated cable, micro-wave links and fibre optics. Quantities and signals to be communicated. Advantages and disadvantages of the various systems. Equipment requirements.

T10 Transient over-voltages in power systems. Switching and lightning overvoltages and their effect on different plant items. Transient over-voltage control and reduction using surge diverters, shield wires and CB are control. Insulation systems, insulation co-ordination, insulation grading in plant items, bushings and capacitor bushings.

T11 The principles of operation, voltage and current range, breaking capacity and field of use of the following types of circuit breakers - bulk oil, small oil volume, air break, vacuum and SF6 (double pressure and puffer types).

T12 The types of isolators in use. Examples include duo-roll, blade and scissor type.

T13 Circuit breaker auxiliary systems encompassing:

- d.c. systems including battery types, charging and protection systems and earth fault detection systems
- SF6 conditioning, storage and handling system

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UET12'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnosing and rectifying faults in electrical energy distribution systems as described in 8) and including:

    A Applying logical diagnostic methods.

    B Using fault scenarios to test the cause of system faults.

    C Identifying faults and competency needed to rectify them.

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D Rectifying faults in system controls.

E Verifying that the system operates correctly.

F Documenting fault rectification.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in electrical energy distribution systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UETTDRIS67A	Solve problems in energy supply network equipment

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to diagnosing and rectifying at least four faults in electrical energy reticulation system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UETTDRIS71A Diagnose and rectify faults in electrical energy supply transmission systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers diagnosing and rectifying faults in electrical energy transmission systems. The unit encompasses safe working practices, interpreting diagrams and technical data, applying knowledge of energy supply and transmission systems to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also

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License to practice **3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits

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Prerequisite Unit(s)

4)

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UETTDRIS67A	Solve problems in energy supply network equipment
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading	5	Writing	5	Numeracy	5

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults.	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct

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ELEMENT	PERFORMANCE CRITERIA	
		operation and safety.
2 Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose electrical energy transmission system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system.
	2.7	Faults in the system components are rectified to raise electrical energy transmission system to its operation standard.
	2.8	System is tested to verify that it operates as intended and to specified requirements.
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to system and the surrounding environment or services and using

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ELEMENT	PERFORMANCE CRITERIA	
		sustainable energy practices.
3 Complete and report fault diagnosis and rectification activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in electrical energy supply transmission systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS71A Electrical power system transmission faults

Evidence shall show an understanding of electrical power system transmission faults to an extent indicated by the following aspects:

T1 Overview of the transmission system including lines, buses, transformers and cables. Line/bus layouts including single and double switching, breaker and a half systems and HV crossing methods.

T2 The principles involved in high voltage a.c. transmission including tower types and configurations, choice of towers or poles (economic and environmental), insulator types and configuration, types of conductors, their configuration and standard nomenclature. Typical line spacing and ground clearances. Line ratings based on ambient temperature. Conductor terminating and clamping equipment including vibration damping principles and equipment.

T3 The principles involved in d.c. transmission including the economics, harmonic generation, VAR requirements and protection difficulties. Types of connections and transformer requirements. Advantages and disadvantages of d.c. transmission. Typical overseas systems. Likely (future) use in this country.

T4 The principles of operation, voltage and current range, breaking capacity and field of use of the following types of circuit breakers.

- bulk oil
- small oil volume
- air break
- air blast
- air puffer
- vacuum and
- SF6 (double pressure and puffer types).

T5 The types of isolators in use. Examples include duo-roll, blade and scissor type.

T6 Circuit breaker auxiliary systems including:

- high pressure air systems and air storage and handling processes
- d.c. systems including battery types, charging and protection systems and earth fault detection systems
- SF6 conditioning, storage and handling system

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REQUIRED SKILLS AND KNOWLEDGE

T7 The characteristics of lines and cables including the calculation of R, X and B for different arrangements of conductor. Typical values for actual lines. Transposition. Models based on line length. Voltage and line regulation. The transmission of power (P) and VARs (Q).

T8 Control of voltage. Conditions leading to voltage collapse and system disintegration. Effects on the system of high/low volts. Voltage control devices including:

- voltage regulators applied to generators and synchronous phase modifiers
- electromagnetic voltage regulators
- series and parallel capacitors
- OLTC transformers and static Var compensations (SVCs)

T9 Range of devices covered by SVCs including:

- saturated reactor compensations (SRs)
- thyristor controlled reactor compensators (TCRs)
- combined TCR/TSCs and
- production of wave-form distorting harmonics and control devices

T10 Importance of the location in the system of voltage control devices

T11 Use of graphical methods to calculate the size of VAr regulating plant

T12 Types of communication systems including telephone, power line carrier, dedicated cable, micro-wave links and fibre optics. Quantities and signals to be communicated. Advantages and disadvantages of the various systems. Equipment requirements

T13 Transient over-voltages in power systems. Switching and lightning overvoltages and their effect on different plant items. Transient over-voltage control and reduction using surge diverters, shield wires and CB are control. Insulation systems, insulation co-ordination, insulation grading in plant items, bushings and capacitor bushings

T14 Factors leading to the generation of corona. Consequences of corona. Reduction of corona including conductor bundling, grading rings and conductor surface treatment

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UET12'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in electrical energy supply transmission systems as described in 8) and including:

    A Applying logical diagnostic methods.

    B Using fault scenarios to test the source of system faults.

    C Identifying faults and competency needed to rectify them.

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D Rectifying faults in system.

E Verifying that the system operates correctly.

F Documenting fault rectification.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in electrical energy supply transmission systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) shall be reassessed in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to diagnosing and rectifying at least four faults in a servo/stepper drive control system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UETTDRIS72A Diagnose and rectify faults in distributed generation systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers diagnosing and rectifying faults in distributed generation systems. The unit encompasses safe working practices, interpreting diagrams and technical data, applying knowledge of energy supply and reticulation systems to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit **2)**

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 5 level or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational

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License to practice **3)**

health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology

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Prerequisite Unit(s) **4)**

	equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UETTDRIS67A	Solve problems in energy supply network equipment
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

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Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.

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ELEMENT	PERFORMANCE CRITERIA	
2 Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Logical diagnostic methods are applied to diagnose distributed generation system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected fault scenarios are tested as being the source of system problems.
	2.6	Causes of the faults are identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system.
	2.7	Faults in the system components are rectified to raise distributed generation system to its operation standard.
	2.8	System is tested to verify that it operates as intended and to specified requirements
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is made safe in accordance with established safety procedures.
	3.3	Rectification of faults is documented in accordance with established procedures.
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and diagnosing and rectifying faults in distributed generation systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS72A Distributed generation systems

Evidence shall show an understanding of distributed generation systems to an extent indicated by the following aspects:

T1 OHS enterprise responsibilities encompassing:

- Provisions of relevant health and safety legislation
- Principles and practice of effective occupational health and safety management
- Management arrangements relating to regulatory compliance
- Enterprise hazards and risks, control measures and relevant expertise required
- Characteristics and composition of workforce and their impact on occupational health and safety management
- Relevance of enterprise management systems to occupational health and safety management
- Analysis of working environment and design of appropriate occupational health and safety management systems
- Analysis of relevant data and evaluation of occupational health and safety system effectiveness
- Assess resources to establish and maintain occupational health and safety management systems.

T2 Distributive generation systems encompassing:

- Concept and application
- Anti-islanding control and protection
- System monitoring and load management.

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Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Diagnose and rectify faults in distributed generation systems as described in 8) and including:

    A Applying logical diagnostic methods.

    B Using fault scenarios to test the cause of system faults.

    C Identifying faults and competency needed to rectify them.

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D Rectifying faults in system controls.

E Verifying that the system operates correctly.

F Documenting fault rectification.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to diagnosing and rectifying faults in distributed generation systems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to diagnosing and rectifying at least four faults in distributed generation systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

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Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UETTDRIS73A Develop engineering solutions for energy supply power transformer problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing engineering solutions to resolve problems with energy supply system protection. It encompasses working safely, apply extensive knowledge of energy supply power transformer operation and their application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note.

Typical transformer problems are those encountered in meeting performance requirements and compliance standards, revising a transformer operating parameters and dealing with transformer malfunctions

Application of the Unit

Application of the Unit

2)

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 6 or higher.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit require a license to practice in the workplace for work involving

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License to practice **3)**

direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **4)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits problems
UEENEEE126A	Provide solutions to basic engineering computational problems
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits
UETTDRIS67A	Solve problems in energy supply network equipment
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus
Distribution Pathway Unit Group	
UETTDRIS70A	Diagnose and rectify faults in

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Prerequisite Unit(s) **4)**

	electrical energy distribution systems
Transmission Pathway Unit Group	
UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission systems
Distributed Generation Pathway Unit Group	
UETTDRIS72A	Diagnose and rectify faults in distributed generation systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop engineering solution for energy supply power transformer problems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the transformer problem is determined from performance specifications and situation reports and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2 Develop engineering solutions for energy supply power transformer problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of supply power transformer arrangements, operation, device characteristics and applications are applied to developing solutions to supply power transformer problems.
	2.3	Parameters, specifications and performance requirements in relation to each transformer problem are obtained in accordance with established procedures.
	2.4	Approaches to resolving supply power transformer problems are analysed to provide

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ELEMENT	PERFORMANCE CRITERIA	
		most effective solutions.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test, document and implement engineering solution for energy supply power transformer problems.	3.1	Solutions to transformer problems are tested to determine their effectiveness and modified where necessary.
	3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.
	3.3	Appropriately competent and qualified person(s) required to implement solutions to supply power transformer problems are coordinated in accordance with regulatory requirements and enterprise policy. (Note)
	3.4	Justification for solutions used to solve supply power transformer problems is documented for inclusion in work/project development records in accordance with professional standards.

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Note: A license to practice in the workplace is required for work involving direct access to plant and
equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing engineering solutions for energy supply power transformer problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS73A Power transformers diagnostics

Evidence shall show an understanding of power transformers to an extent indicated by the following aspects:

T1 Transformer construction and operating principles encompassing:

- various types of lamination style and core construction used in single phase, three phase, double wound and auto transformers.
- different winding styles/types used in transformers.
- how input current is limited on no load and how power is transferred from primary to secondary when a load is connected.
- using the transformation ratio to determine an unknown quantity of V, I, VA.
- significance of nameplate data items.
- operation of a transformer under load/no load conditions.
- the reason any particular type of transformer is used in a specific application.
- safety features specified in regulatory standards with respect to transformers.
- safety features specified in regulatory standards with respect to isolating transformers.
- basic insulation resistance, continuity and winding identification tests.

T2 Transformer parameters encompassing:

- the percentage impedance of a transformer by test.
- percentage impedance of a transformer by calculation.
- the equivalent circuit of a transformer.
- calculation of voltage regulation.
- losses that occur in a transformer.
- tests to determine losses.
- efficiency and state typical values.
- the all day efficiency of a transformer.

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REQUIRED SKILLS AND KNOWLEDGE

T3 Cooling methods encompassing:

- methods of natural and forced cooling.
- properties of transformer oil.
- tests performed on transformer oil.
- auxiliary equipment
- the purpose and operation of the types of auxiliary equipment used on transformers - bushings, explosion vents, surge diverters, tap changers, conservator, breathers and desiccants, gas relays, temperature indicators.

T4 Instrument transformers encompassing:

- construction of current transformers.
- uses and ratings of current transformers.
- construction of voltage transformers.
- uses and ratings of voltage transformers.
- safety techniques when using instrument transformers.

T5 Transformer connections encompassing:

- vector group of a transformer from a connection diagram.
- connections of a three-phase transformer to create a particular vector group.
- reasons for using the different vector groups.
- purpose of tertiary windings.
- consequences/effect of an incorrect connection.

T6 Parallel operation encompassing:

- polarity markings for the windings of a transformer.
- conditions/restrictions for parallel operation of transformers.
- calculation of loading on transformers operating in parallel.
- connection of transformers in parallel to supply a common load.
- the consequences/effect of an incorrect connection.

T7 Harmonics in transformers encompassing:

- how harmonics are generated in transformers.
- problems caused by harmonics in transformers.
- measurement of the harmonics in a transformer.
- methods/equipment used to overcome harmonics in transformers.

T8 High voltage isolation encompassing:

- the term high voltage.
- procedures for isolating high voltage apparatus.
- regulations with respect to access permits.
- clearances to be observed with respect to high voltages up to 33 kV.
- the term ‘step’ and ‘touch’ potential.

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment

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instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UET12'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop engineering solutions for energy supply power transformer problems as described in 8) and including:

    A Understanding the extent of the transformer problems.

    B Forming effective strategies for solution

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development and implementation.

C Obtaining transformer parameters, specifications and performance requirements appropriate to each problem.

D Testing and solutions to transformer problems.

E Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.

F Documenting justification of solutions implemented in accordance with professional standards.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved

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industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing engineering solutions for energy supply power transformer problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UETTDRIS70A	Diagnose and rectify faults in electrical energy supply distribution system

OR

UETTDRIS72A	Diagnose and rectify faults in distributed generation systems

OR

UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission system

AND

UEENEEG149A	Solve problems in complex polyphase power circuits

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational

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health and safety unit(s) shall be reassessed in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing engineering solution for at least four supply power transformer problems.

Note.

Typical transformer problems are those encountered in meeting performance requirements and compliance standards, revising a transformer operating parameters and dealing with transformer malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical

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UETTDRIS74A Develop engineering solutions for energy supply system protection problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers developing engineering solutions to resolve problems with energy supply system protection. It encompasses working safely, apply extensive knowledge of energy supply system protection operation, protection devices and their application, gathering and analysing data, applying problem solving techniques, developing and documenting solutions and alternatives.

Note:

Typical protection problems are those encountered in meeting performance requirements and compliance standards, revising a protection operating parameters and dealing with protection malfunctions.

Application of the Unit

Application of the Unit **2)**

This unit applies to any recognised development program that leads to the acquisition of a formal award at AQF level 6 or higher.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace for work involving

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License to practice **3)**

direct access to plant and equipment connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace

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Prerequisite Unit(s) **4)**

UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits problems
UEENEEE126A	Provide solutions to basic engineering computational problems
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. Circuits
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits
UETTDRIS67A	Solve problems in energy supply network equipment
UETTDRIS68A	Solve problems in energy supply network protection equipment and systems
UETTDRIS69A	Diagnose and rectify faults in energy supply apparatus
Distribution Pathway Unit Group	
UETTDRIS70A	Diagnose and rectify faults in electrical energy distribution

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Prerequisite Unit(s) **4)**

	systems
Transmission Pathway Unit Group	
UETTDRIS71A	Diagnose and rectify faults in electrical energy supply transmission systems
Distributed Generation Pathway Unit Group	
UETTDRIS72A	Diagnose and rectify faults in distributed generation systems

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop engineering solution for energy supply system protection problems.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood.
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	The extent of the protection problem is determined from performance specifications and situation reports and in consultations with relevant persons.
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
2 Develop engineering solution for energy supply system protection.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Knowledge of supply system protection arrangements, operation, device characteristics and applications are applied to developing solutions to supply system protection problems.
	2.3	Parameters, specifications and performance requirements in relation to each protection problem are obtained in accordance with established procedures.
	2.4	Approaches to resolving supply system protection problems are analysed to provide

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ELEMENT	PERFORMANCE CRITERIA	
		most effective solutions.
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test, document and implement engineering solution for energy supply system protection problems.	3.1	Solutions to protection problems are tested to determine their effectiveness and modified where necessary.
	3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.
	3.3	Appropriately competent and qualified person(s) required to implement solutions to supply system protection problems are coordinated in accordance with regulatory requirements and enterprise policy. (Note)
	3.4	Justification for solutions used to solve supply system protection problems is documented for inclusion in work/project development records in accordance with professional standards.

Note:

A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing engineering solutions for energy supply system protection problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TIS74A Electrical power system protection diagnostic

Evidence shall show an understanding of diagnosing faults in electrical power system protection to an extent indicated by the following aspects:

T1 Protection scheme requirements encompassing:

- Requirements of a protection scheme - relationship to primary system design, purpose of protection, safety of persons, protection of plant, system instability, system break up, loss of customers, loss of revenue, protection zones, restricted schemes, unrestricted schemes, duplicate protection, local backup protection, remote backup protection, selectivity, discrimination, stability, sensitivity, reliability
- Components of a protection scheme - current transformers, potential transformers, summation current transformers, interposing transformers, multi-tapped transformers, all-or-nothing relays, induction relays, balanced beam relays, directional relays, biased relays, solid state relays, microprocessor based relays, gas relays, thermal sensors, hardwired communication, powerline carriers systems, microwave systems, fibre optic systems, need for isolation, need for interfacing
- Protection applied to buses - overload, differential, earth leakage, structure leakage, combined schemes, protection overlap
- Protection applied to transformers - biased differential, gas, winding temperature, oil temperature
- Protection applied to single/radial lines - overcurrent, earth leakage, slow earth leakage, distance, auto reclose, sectionalising, over voltage
- Protection applied to interconnected lines - overcurrent, pilot wire, directional, directional overcurrent, current differential, phase comparison, current comparison, distance, impedance, admittance, offset

T2 Discrete protection systems encompassing:

- Earth fault protection - master earth leakage schemes, sensitive earth fault relays and schemes, residual earth fault scheme, core balance earth fault scheme, frame/structure earth leakage scheme, time graded discrimination, backup protection
- Overcurrent protection - feeder overcurrent protection, instantaneous overcurrent schemes, inverse timed overcurrent schemes, types and location of components of an overcurrent scheme, CT summation, time graded discrimination, backup protection

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REQUIRED SKILLS AND KNOWLEDGE

- Alarms and controls - auxiliary relays, voltage regulating relays, line drop compensation, gas relay types, gas relay scheme operation and setting, over temperature schemes

T3 Interdependent protection systems encompassing:

- Overcurrent and earth leakage intertripping, interlocking and blocking - logic mapping, master control, electromechanical, electronic, shading coils
- Pilot wire, phase comparison - opposed voltage schemes, circulating current schemes, location of components of a scheme, pilot supervisory techniques,
- Load shedding, voltage control, parallel operation, load rejection
- CB failure protection
- Reclose systems - applications, single shot, multishot, blocking schemes, synchronisation checking

T4 Complex protection systems encompassing:

- Distance - characteristics, electromechanical, electronic, impedance, mho, offset mho, switched schemes, non-switched schemes, blocking schemes, bus zone
- Differential, transformer differential, bus overcurrent - principles, feeder protection, transformer protection, bias systems, harmonic restraint, CT connections, bus protection, low impedance schemes, high impedance schemes, bus overcurrent schemes, generator protection, CT connections, special considerations, digital systems
- Types of revenue metering
- Applications of SCADA
- Complex protection systems for communications
- Harmonic control
- Point on wave switching

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Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

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Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UET12'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop engineering solutions for energy supply system protection problems as described in 8) and including:

    A Understanding the extent of the protection problem.

    B Forming effective strategies for solution development and implementation.

    C Obtaining protection parameters, specifications and performance requirements appropriate to each

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problem.

D Testing and solutions to protection problems.

E Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.

F Documenting justification of solutions implemented in accordance with professional standards.

G Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing engineering solutions for energy supply system protection problems.

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Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UETTDRIS70A OR	Diagnose and rectify faults in electrical energy distribution system
UETTDRIS72A OR	Diagnose and rectify faults in distributed generation systems
UETTDRIS71A OR	Diagnose and rectify faults in electrical energy supply transmission system
UEENEEG149A	Solve problems in complex polyphase power circuits

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) shall be reassessed in relation to this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing engineering solution for at least four supply system protection problems.

Note.

Typical protection problems are those encountered in meeting performance requirements and compliance standards, revising a protection operating parameters and dealing with protection malfunctions.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	**11)**
	Electrical

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UETTDRSB23A Install and maintain substation direct current systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This Competency Standard Unit covers the installation and maintenance of substation DC systems such as main batteries, communication batteries, DC lighting systems, battery chargers, uninterrupted power supply (UPS) systems and associated control circuit in accordance with enterprise requirements. It includes the diagnosis of faults, the replacement of faulty equipment, the conducting of pre-commissioning/re-commissioning tests and the interpretation of test results against agreed specification.

Application of the Unit

Application of the Unit **2)**

This Competency Standard Unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit requires a licence/registration to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to Occupational Health and

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License to practice **3)**

Safety, electricity/telecommunications/gas/water industry safety and compliance, industrial relations, environmental protection, anti discrimination and training. Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three

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Prerequisite Unit(s) **4)**

	phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in electromagnetic devices and related circuits
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical control circuits
UEENEEK142A	Apply environmentally and sustainable energy procedures in the energy sector

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	4	Writing	4	Numeracy	4

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Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare/plan to install and/or maintain substation DC systems	1.1	Work schedules including drawings, plans, requirements procedures and material lists are acquired, analysed and the extent of work determined.
	1.2	Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites.
	1.3	Hazards are identified, OHS risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear, to ensure safe systems of work are followed and according to established procedures.
	1.4	Work is prioritised and sequenced for the most efficient and effective outcome following consultation with others for completion within acceptable timeframes, to agreed quality

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ELEMENT	PERFORMANCE CRITERIA	
		standards and in accordance with established policies and procedures.
	1.5	Risk control measures are identified, prioritised, implemented and evaluated against the work schedule.
	1.6	Resources including personnel, equipment, tools and personal protective equipment required for the job are identified, acquired and confirmed in safe/technical working order.
	1.7	Liaison issues with other personnel and/or authorities are resolved and activities coordinated to facilitate the work.
	1.8	Personnel participating in the work including plant operators and contractors are fully briefed, their respective responsibilities explained and coordinated and appropriate authorisation checked in accordance with established procedures.
	1.9	Work site is prepared according to the work schedule and to minimise risk and damage to property and personnel in accordance with established procedures.
2 Carry out the installation and maintenance of substation DC systems.	2.1	OHS and sustainable energy principles and practices to reduce the incidence of accidents and minimise waste are implemented and monitored in accordance with established procedures.
	2.2	CPR, Rescue from live electrical apparatus and other related safety procedures are in place according to requirements and established procedures.
	2.3	Safe working documentation is acquired and requirements completed in accordance with established procedures.
	2.4	Lifting, climbing and working aloft, use of power tools/equipment techniques and practices are safely exercised in accordance with established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.5	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported to the immediate authorised persons for directions according to established procedures.
	2.6	Essential knowledge and associated skills are applied for the safe installation and maintenance of substation DC systems to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements.
	2.7	Installation of substation DC systems is carried out in accordance with the work schedule and requirements and/or established procedures.
	2.8	Maintenance of substation DC systems is carried out in accordance with the work schedule and requirements and/or established procedures.
	2.9	Installation and/or maintenance of substation DC systems are completed in an agreed timeframe and to acceptable quality standards with a minimum of waste according to requirements.
	2.10	Unplanned events or conditions are responded to in accordance with established procedures.
	2.11	Performance tests of the substation DC systems are carried out in accordance with established procedures and specifications.
	2.12	Ongoing checks of quality of the work are undertaken in accordance with requirements and established procedures to ensure a quality outcome is achieved for the client/customer and to a community/industry standard.

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ELEMENT	PERFORMANCE CRITERIA	
3 Complete the installation and maintenance of substation DC systems	3.1	Work undertaken is checked against work schedule for conformance with requirements, anomalies reported and solutions identified in accordance with established procedures.
	3.2	Safe working documentation is surrendered and equipment made ready for service.
	3.3	Work site is rehabilitated, cleaned up and confirmed safe in accordance with established procedures.
	3.4	Tools, equipment and any surplus resources and materials are cleaned, checked and returned to storage in accordance with established procedures.
	3.5	Required works completion records, reports and/or documentation and information are completed, processed and appropriate personnel notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of installing and maintaining substation DC systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TSB23A Substation direct current systems

Evidence shall show an understanding of substation direct current systems to an extent indicated by the following aspects

T1 Safe working on energised low voltage equipment encompassing:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements
- Safety precautions specific to working on or near energised low voltage conductors - safe working practices and procedures, identification of hazards, assessment and control of OHS risks, types, selection, maintenance and use of personal protective equipment
- Work on or near energised LV conductors - types and function of specialised tools, safe working practices when using specialised tools, methods of using specialised tools, safe procedures for work on panels and in cubicles on or near energised LV conductors, release and rescue procedures for work on or near exposed energised LV conductors.

T2 Enterprise specific — policy and procedure instructions encompassing:

- Responsibilities and duty of care of employer and employee relationship
- Methods of obtaining the up-to-date information on enterprise policy and procedures
- Rules and regulations
- Induction into workplace - location of work area and storage area, timetable, uniform, personal well-being, housekeeping rules, emergency procedures, evacuation procedures
- Techniques when deal with others - working in teams, customer relation, complaint and issues procedures.
- Overview of enterprise professional development - fire fighting procedures, fatigue management, training and competency development - understanding and promotion

T3 Enterprises specific — OHS instructions encompassing:

- Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the OHS policies and procedures
- Methods of obtaining the up-to-date information on enterprise OHS policy and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Specific enterprise personal protection equipment - type and application, where and when to be used, method of replacement, responsibility of maintenance including cleaning inspection and testing, emergency response, rescue, evacuation and First Aid procedures
- Personal well-being – hygiene, fatigue/stress management, drugs/alcohol
- OHS training - induction training, specific hazard training, specific task or equipment training, emergency and evacuation training, training as part of broader programs such as equipment operation
- OHS records including audits, inspection reports, workplace health and environmental monitoring records, training and instruction records, manufacturers and suppliers information such as MSDSs, registers, maintenance reports, workers compensation and rehabilitation records and First Aid/medical records

T4 Enterprises specific — technical drawing and documents encompassing:

- Types and application of enterprise specific drawings and documents - electrical and electronic drawings, mechanical drawings, project charts, schedules, graphs, technical manuals and catalogues
- Instruction/worksheets sheets - types and application of enterprise specific symbols and diagrams
- Title box - description of parts and version control.

T5 Enterprise specific switching diagrams and drawing encompassing:

- Types and application of enterprise specific switching drawings and documents - wiring and schematic diagrams and switching symbols, mechanical drawings dealing with switching operations, project charts, switching schedules, graphs, technical manuals and catalogues, instruction/work sheets.
- Interpretation of different system switching diagrams - LV system switching diagrams, DC traction supply sectioning diagrams, HV transmission and distribution system symbols and feeder plans, processes of updating switching diagrams

T6 Enterprises specific specialised tools encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the use and care of specialised tools (voltage detectors; polarity testers, phase rotation)
- Characteristics, capabilities and application of specialised tools for a particular job
- Safety policies, procedures and precautions with regards to using, transporting and storage of specialised tools
- Selection methods for obtaining the correct specialised tool for the particular job including during procurement, purchasing and or hiring arrangements
- Techniques in pre-use inspection on the serviceability of specialised tools
- Techniques in the selection, use, maintenance, and care and storage of specialised tools
- Identifying OHS hazards, assessing and controlling risks associated with their use
- Techniques for the safe use of specialised power tools.

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REQUIRED SKILLS AND KNOWLEDGE

T7 Enterprise Specific Equipment Installation Procedures encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to equipment installation
- Requirements for the use of manuals, substation diagrams/plans and drawings
- Types, characteristics and capabilities of HV substation equipment to be installed
- Identification of components within the equipment to be Installed and associated control housings
- Use, characteristics and capabilities of specialised tools and equipment
- Enterprise Specific Policies and Procedures for equipment to be installed
- Control equipment and auxiliary relays, flags and alarms
- Techniques in evaluating serviceability of equipment to be Installed
- Safety precautions when testing and measuring equipment to be Installed - safe working practices and procedures, identification of hazards, assessment and control of OHS risks, types, selection, maintenance and use of personal protective equipment, responsibilities and protocols, safe working clearances
- Remote and local operating principles and conventions

T8 Enterprise Specific Data Management Processes encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to Data Management
- Requirements for the use of manuals, substation diagrams/plans and drawings
- Types of enterprise specific computer software
- Techniques in storing and retrieving data and reports from the computer
- Techniques in using the Data Management systems in following necessary commands and protocols in accordance with the Enterprise Specific Procedures
- Calculation of results and data measurements using the computer
- Techniques in the preparation of preliminary works creation and closure.

T9 Fault conditions and symptoms related to the plant and/or equipment type encompassing:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements pertaining to typical fault conditions and systems
- Interpretation of faults in operating mechanisms which may include drive trains and mechanical power drives, stored energy systems including hydraulic systems, pneumatic systems and mechanical storage systems, accumulators
- Interpretation of faults in electrical control systems which may include electro-mechanical relay systems, micro-processor based systems, PLC systems, integrated control systems or combinations of electrical/mechanical systems
- Types of electrical systems including AC, DC and combinations of both
- Types of fault conditions - failure to operate, failure in service and include the appropriate procedures for work on in service plant/equipment
- Types of symptoms - alarms, relay flags, mechanical defects, insulation

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REQUIRED SKILLS AND KNOWLEDGE

deterioration, leaks, over-pressure, under pressure, out of tolerance measurements and checks.

T10 Substation equipment components and materials related to the plant and/or equipment type encompassing:

- Types of components - complete unit of plant and/or equipment, replacement components or appropriate substitutes, their dimensions, suitability and serviceability; also the components associated with the local control systems of the equipment including indication of levels, quantities, volumes, pressures and temperatures and the operating principles of these devices and components
- Types of materials - insulation, construction, fabrication or lubrication of the plant/equipment
- Techniques in enterprise procedures and regulatory/legislative requirements for the handling/use and storage of equipment components and materials which may present an OHS hazard to persons in the workplace

T11 Substation safety practices encompassing:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements pertaining to substation safety practices
- Techniques in the use of protective apparatus and apparel for substations work, including responsibilities with regard to the use and maintenance of protective apparatus and apparel and the types of protective apparatus and apparel used for work in substations
- Requirements for the use of ladders and appropriate ladder types for work in substations - safe work methods when carrying, erecting, collapsing and lowering different types of extension ladder against substation structures, plant and equipment, maintenance checks on different types of ladders, renewal of extension ropes and the safety issues relating to clearances from energised conductors
- Requirements for climbing and working at heights in substations - attached climbing principles, selection, use and operation of elevated work platforms and any OHS requirements associated with the use of EWPs
- Control of small fires - identification, selection and operation of the appropriate extinguishing mediums for various types of fires and the precautions for personal protection when fighting small fires
- Control of oil spills - identification, use and maintenance of spill oil control equipment and materials, oil containment facilities and systems
- Rescue and release procedures - the rescue personnel from energised conductors, emergency descent from an EWP and may include rescue from confined spaces.
- Enterprise requirements - safe access and Authorisation to Work procedures, use of mobile extendable equipment on or near energised HV conductors, emergency response procedures.
- Hazards associated with work in substations including earthing systems, transfer potentials, step and touch effects, electrostatic and electromagnetic induction, dangers of near approach to energised conductors.

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REQUIRED SKILLS AND KNOWLEDGE

T12 Design principles of Substation LV AC and DC supply systems encompassing:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements
- Wiring conventions, systems and labelling conventions
- Substation equipment identification and layout, wiring and schematic diagrams and other appropriate diagrammatic representations
- LV design specifications, supply requirements, electrical load assessments
- Substation LV system distribution requirements - substation batteries, isolation requirements, paralleling requirements, battery chargers, DC distribution panels and control systems, AC distribution panels and control systems, auto change-over requirements,
- Control equipment and auxiliary relays, flags and alarms,
- Common panel layouts.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the competency standard unit and must be read in conjunction with the Performance Criteria and the Range Statement of the competency standard unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all component parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

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Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET12". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge

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and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and

- Demonstrate an appropriate level of employability skills; and

- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures; and
  - Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	At least one of the following:	Nickel cadmium batteries Lead acid batteries Gel cell batteries
B	At least one of the following:	Main batteries Communication batteries
C	All of the following:	Battery chargers DC control circuits
D	At least two of the following:	Cell voltage test Hydrometer/specific gravity test Battery discharge and capacity tests Impedance testing
E	At least one occasion	Dealing with an unplanned event by drawing on essential

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		knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual installation and maintenance of substation DC systems.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working

At realistic heights above ground, i.e. above 3 metres, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

9.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

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Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the competency standard unit as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall be demonstrated in relation to the installation and maintenance of DC systems contained in and around substations including the associated control systems.

DC systems may include lighting systems, battery chargers, substation batteries, communication systems batteries, isolated pilot batteries and uninterrupted power supply (UPS) systems.

Checks and measurements include but are not limited to cell voltage test, hydrometer/specific gravity test, battery discharge and capacity tests, impedance tests.

Battery cell types include but not limited to nickel cadmium batteries, lead acid batteries, sealed and unsealed batteries.

The following constants and variables included in the element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation

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RANGE STATEMENT

- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Substation Units

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UETTDRSB29A Maintain capacitor bank equipment for voltage regulation

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This Competency Standard Unit covers the maintenance and repair of substation voltage regulating equipment and is restricted to high voltage capacitor banks and their associated switching reactors and the inspection, recording of information, testing and measurement of the associated control circuits. It also includes the range of acceptance tests and discharge requirements for complete units within a substation in accordance with established enterprise standards and procedures. It also encompasses fault diagnosis and return to service tests and interpretation of test results against agreed specifications.

Application of the Unit

Application of the Unit **2)**

This Competency Standard Unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit requires a licence/registration to practice in the work place subject to regulations for undertaking of electrical work. Practice in

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License to practice **3)**

workplace and during training is also subject to regulations directly related to Occupational Health and Safety, electricity/telecommunications/gas/water industry safety and compliance, industrial relations, environmental protection, anti discrimination and training. Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with

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Prerequisite Unit(s) **4)**

	electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in electromagnetic devices and related circuits
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEK142A	Apply environmentally and sustainable energy procedures in the energy sector

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 "Literacy and Numeracy"

Reading	4	Writing	4	Numeracy	4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

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Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare/plan to maintain voltage regulating equipment (capacitor banks)	1.1	Work schedules including drawings, plans, requirements procedures and material lists are acquired, analysed and the extent of work determined.
	1.2	Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites.
	1.3	Hazards are identified, OHS risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear, to ensure safe systems of work are followed and according to established procedures.
	1.4	Work is prioritised and sequenced for the most efficient and effective outcome following consultation with others for completion within acceptable timeframes, to agreed quality standards and in accordance with established policies and procedures.
	1.5	Risk control measures are identified, prioritised, implemented and evaluated against the work schedule.
	1.6	Resources including personnel, equipment, tools and personal protective equipment required for the job are identified, acquired and confirmed in safe/technical working order.
	1.7	Liaison issues with other personnel and/or authorities are resolved and activities coordinated to facilitate the work.

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ELEMENT	PERFORMANCE CRITERIA	
	1.8	Personnel participating in the work including plant operators and contractors are fully briefed, their respective responsibilities explained and coordinated and appropriate authorisation checked in accordance with established procedures.
	1.9	Work site is prepared according to the work schedule and to minimise risk and damage to property and personnel in accordance with established procedures.
2 Carry out the maintenance of voltage regulating equipment (capacitor banks)	2.1	OHS and sustainable energy principles and practices to reduce the incidence of accidents and minimise waste are implemented and monitored in accordance with established procedures.
	2.2	CPR, rescue from live electrical apparatus and other related safety procedures are in place according to requirements and established procedures.
	2.3	Safe working documentation is acquired and requirements completed in accordance with established procedures.
	2.4	Lifting, climbing and working aloft, use of power tools/equipment techniques and practices are safely exercised in accordance with established procedures.
	2.5	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported to the immediate authorised persons for directions according to established procedures.
	2.6	Capacitor bank is isolated, discharged and maintained in accordance with requirements.
	2.7	Defective capacitor elements are identified, located and replaced in accordance with manufacturers and enterprise procedures and recommendations.
	2.8	Capacitor network is balanced and pre-service tests and measurements completed in accordance

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ELEMENT	PERFORMANCE CRITERIA	
		with enterprise procedures.
	2.9	Essential knowledge and associated skills are applied for the safe maintenance of voltage regulating equipment (capacitor banks) to ensure completion in an agreed timeframe and to quality standards with a minimum of waste according to requirements.
	2.10	Unplanned events or conditions are responded to in accordance with established procedures.
3 Complete the maintenance of voltage regulating equipment (capacitor banks)	3.1	Work undertaken is checked against work schedule for conformance with requirements, anomalies reported and solutions identified in accordance with established procedures.
	3.2	Safe working documentation is surrendered and the capacitor bank is made ready for service.
	3.3	Work site is rehabilitated, cleaned up and confirmed safe in accordance with established procedures.
	3.4	Tools, equipment and any surplus resources and materials are cleaned, checked and returned to storage in accordance with established procedures.
	3.5	Required works completion records, reports and/or documentation and information are completed, processed and appropriate personnel notified in accordance with established procedures.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of maintaining voltage regulating equipment - capacitor banks.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TSB29A Capacitor bank equipment for voltage regulation

Evidence shall show an understanding of capacitor bank equipment for voltage regulation to an extent indicated by the following aspects:

T1 Safe working on energised low voltage equipment encompassing:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements
- Safety precautions specific to working on or near energised low voltage conductors - safe working practices and procedures, identification of hazards, assessment and control of OHS risks, types, selection, maintenance and use of personal protective equipment
- Work on or near energised LV conductors - types and function of specialised tools, safe working practices when using specialised tools, methods of using specialised tools, safe procedures for work on panels and in cubicles on or near energised LV conductors, release and rescue procedures for work on or near exposed energised LV conductors.

T2 Enterprise specific — policy and procedure instructions encompassing:

- Responsibilities and duty of care of employer and employee relationship
- Methods of obtaining the up-to-date information on enterprise policy and procedures
- Rules and regulations
- Induction into workplace - location of work area and storage area, timetable, uniform, personal well-being, housekeeping rules, emergency procedures, evacuation procedures
- Techniques when deal with others - working in teams, customer relation, complaint and issues procedures.
- Overview of enterprise professional development - fire fighting procedures, fatigue management, training and competency development - understanding and promotion

T3 Enterprises specific — OHS instructions encompassing:

- Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the OHS policies and procedures
- Methods of obtaining the up-to-date information on enterprise OHS policy and procedures

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REQUIRED SKILLS AND KNOWLEDGE

- Specific enterprise personal protection equipment - type and application, where and when to be used, method of replacement, responsibility of maintenance including cleaning inspection and testing, emergency response, rescue, evacuation and First Aid procedures
- Personal well-being – hygiene, fatigue/stress management, drugs/alcohol
- OHS training - induction training, specific hazard training, specific task or equipment training, emergency and evacuation training, training as part of broader programs such as equipment operation
- OHS records including audits, inspection reports, workplace health and environmental monitoring records, training and instruction records, manufacturers and suppliers information such as MSDSs, registers, maintenance reports, workers compensation and rehabilitation records and First Aid/medical records

T4 Enterprises specific — technical drawing and documents encompassing:

- Types and application of enterprise specific drawings and documents - electrical and electronic drawings, mechanical drawings, project charts, schedules, graphs, technical manuals and catalogues
- Instruction/worksheets sheets - types and application of enterprise specific symbols and diagrams
- Title box - description of parts and version control.

T5 Enterprise specific switching diagrams and drawing encompassing:

- Types and application of enterprise specific switching drawings and documents - wiring and schematic diagrams and switching symbols, mechanical drawings dealing with switching operations, project charts, switching schedules, graphs, technical manuals and catalogues, instruction/work sheets.
- Interpretation of different system switching diagrams - LV system switching diagrams, DC traction supply sectioning diagrams, HV transmission and distribution system symbols and feeder plans, processes of updating switching diagrams

T6 Enterprises specific specialised tools encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the use and care of specialised tools (voltage detectors; polarity testers, phase rotation)
- Characteristics, capabilities and application of specialised tools for a particular job
- Safety policies, procedures and precautions with regards to using, transporting and storage of specialised tools
- Selection methods for obtaining the correct specialised tool for the particular job including during procurement, purchasing and or hiring arrangements
- Techniques in pre-use inspection on the serviceability of specialised tools
- Techniques in the selection, use, maintenance, and care and storage of specialised tools
- Identifying OHS hazards, assessing and controlling risks associated with their use
- Techniques for the safe use of specialised power tools.

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REQUIRED SKILLS AND KNOWLEDGE

T7 Enterprise Specific Equipment Installation Procedures encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to equipment installation
- Requirements for the use of manuals, substation diagrams/plans and drawings
- Types, characteristics and capabilities of HV substation equipment to be installed
- Identification of components within the equipment to be Installed and associated control housings
- Use, characteristics and capabilities of specialised tools and equipment
- Enterprise Specific Policies and Procedures for equipment to be installed
- Control equipment and auxiliary relays, flags and alarms
- Techniques in evaluating serviceability of equipment to be Installed
- Safety precautions when testing and measuring equipment to be Installed - safe working practices and procedures, identification of hazards, assessment and control of OHS risks, types, selection, maintenance and use of personal protective equipment, responsibilities and protocols, safe working clearances
- Remote and local operating principles and conventions

T8 Enterprise Specific Data Management Processes encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to Data Management
- Requirements for the use of manuals, substation diagrams/plans and drawings
- Types of enterprise specific computer software
- Techniques in storing and retrieving data and reports from the computer
- Techniques in using the Data Management systems in following necessary commands and protocols in accordance with the Enterprise Specific Procedures
- Calculation of results and data measurements using the computer
- Techniques in the preparation of preliminary works creation and closure.

T9 Fault conditions and symptoms related to the plant and/or equipment type encompassing:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements pertaining to typical fault conditions and systems
- Interpretation of faults in operating mechanisms which may include drive trains and mechanical power drives, stored energy systems including hydraulic systems, pneumatic systems and mechanical storage systems, accumulators
- Interpretation of faults in electrical control systems which may include electro-mechanical relay systems, micro-processor based systems, PLC systems, integrated control systems or combinations of electrical/mechanical systems
- Types of electrical systems including AC, DC and combinations of both
- Types of fault conditions - failure to operate, failure in service and include the appropriate procedures for work on in service plant/equipment
- Types of symptoms - alarms, relay flags, mechanical defects, insulation

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REQUIRED SKILLS AND KNOWLEDGE

deterioration, leaks, over-pressure, under pressure, out of tolerance measurements and checks.

T10 Substation equipment components and materials related to the plant and/or equipment type encompassing:

- Types of components - complete unit of plant and/or equipment, replacement components or appropriate substitutes, their dimensions, suitability and serviceability; also the components associated with the local control systems of the equipment including indication of levels, quantities, volumes, pressures and temperatures and the operating principles of these devices and components
- Types of materials - insulation, construction, fabrication or lubrication of the plant/equipment
- Techniques in enterprise procedures and regulatory/legislative requirements for the handling/use and storage of equipment components and materials which may present an OHS hazard to persons in the workplace

T11 Substation safety practices encompassing:

- Standards, codes, Commonwealth, State/Territory/local government legislation, supply authority regulations and or enterprise requirements pertaining to substation safety practices
- Techniques in the use of protective apparatus and apparel for substations work, including responsibilities with regard to the use and maintenance of protective apparatus and apparel and the types of protective apparatus and apparel used for work in substations
- Requirements for the use of ladders and appropriate ladder types for work in substations - safe work methods when carrying, erecting, collapsing and lowering different types of extension ladder against substation structures, plant and equipment, maintenance checks on different types of ladders, renewal of extension ropes and the safety issues relating to clearances from energised conductors
- Requirements for climbing and working at heights in substations - attached climbing principles, selection, use and operation of elevated work platforms and any OHS requirements associated with the use of EWPs
- Control of small fires - identification, selection and operation of the appropriate extinguishing mediums for various types of fires and the precautions for personal protection when fighting small fires
- Control of oil spills - identification, use and maintenance of spill oil control equipment and materials, oil containment facilities and systems
- Rescue and release procedures - the rescue personnel from energised conductors, emergency descent from an EWP and may include rescue from confined spaces.
- Enterprise requirements - safe access and Authorisation to Work procedures, use of mobile extendable equipment on or near energised HV conductors, emergency response procedures.
- Hazards associated with work in substations including earthing systems, transfer potentials, step and touch effects, electrostatic and electromagnetic induction, dangers of near approach to energised conductors

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REQUIRED SKILLS AND KNOWLEDGE

T12 Principles of power transformer construction and operations encompassing:

- Applications of static reactive plant in high voltage networks, including voltage control, VAR control, transient response capacity
- Types of static reactive plant including high voltage capacitors, high voltage reactors, static VAR compensators and combinations of these
- Operating characteristics and operational constraints including point on wave switching issues
- Ratings, cooling systems and control systems and ancillary equipment used
- Configurations and system layout including single star, double star, bridge type
- Typical protection systems used including neutral unbalance current, neutral unbalance voltage
- Techniques used when balancing elements within static reactive plant
- Safety precautions when testing and maintaining high voltage static reactive plant - safe working practices and procedures, identification of hazards, assessment and control of OHS risks, types, selection, maintenance and use of personal protective equipment.

Evidence Guide

EVIDENCE GUIDE

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The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all component parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full

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can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET12". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and

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- Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
- Demonstrate an appropriate level of employability skills; and

- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures; and
  - Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	At least one of the following:	Double star neutral current unbalance type Voltage unbalance type, single star
B	At least two of the following:	Internal discharge resistor cans External resistor type Switching reactors Neutral unbalance current transformer
C	At least three of the following:	Insulation resistance tests Capacitance tests Unbalance current/voltage tests Primary injection tests High voltage dc

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		withstand tests
D	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual maintenance of high voltage regulating equipment capacitor banks and their associated reactors and control circuits installed in substations.

In addition to the resources listed above, in context of and specific resources for assessment, evidence should show demonstrated competency working:

At realistic heights above ground, i.e. above 3 metres, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

9.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all

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necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the competency standard unit as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit may be demonstrated in relation to high voltage capacitor banks and their associated reactors and control circuits installed in substations.

Checks and measurements may include inspection and cleaning, identification and replacement of defective/unserviceable elements/cans, unbalance current/voltage tests, functional tests and control/alarm system checks.

The following constants and variables included in the element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues

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RANGE STATEMENT

- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Substation Units

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UETTDRSB39A Perform power system substation switching operation to a given schedule

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This Competency Standard Unit covers the conducting of switching operations in a substation in accordance to a given instructions, switching schedule and established enterprises procedures. It encompasses the operation of substation switching devices such as circuit breakers, air break switches, fuses, reclosers, ring main units and isolators.

Application of the Unit

Application of the Unit **2)**

This Competency Standard Unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit may require a licence/registration to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to Occupational Health and Safety, electricity/telecommunications/gas/water industry safety and compliance, industrial relations, environmental

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License to practice **3)**

protection, anti discrimination and training. Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Transmission Overhead

Distribution Overhead

Rail Traction

Distribution Cable Jointing

Electrical

Common Unit Group

Unit Code	Unit Title
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and

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Prerequisite Unit(s)	**4)**	
		specifications
	UEENEEG101A	Solve problems in electromagnetic devices and related circuits
	UEENEEG102A	Solve problems in low voltage a.c. Circuits
	UETTDREL16A	Working safely near live electrical apparatus
	Transmission Overhead Pathway Group	
	UETTDREL11A	Apply sustainable energy and environmental procedures
	UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
	UETTDRIS54A	Install and maintain poles, structures, overhead conductors and cables
	UETTDRTP26A	Install transmission structures and associated hardware
	UETTDRTP27A	Maintain transmission structures and associated hardware
	UETTDRTP29A	Install and maintain transmission overhead conductors and cables
	Distribution Overhead Pathway Group	
	UETTDRDP12A	Maintain overhead energised low voltage conductors and cables
	UETTDREL11A	Apply sustainable energy and environmental procedures
	UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
	UETTDRIS41A	Install network infrastructure electrical equipment

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Prerequisite Unit(s) **4)**

UETTDRIS42A	Maintain network infrastructure electrical equipment
UETTDRIS52A	Install and maintain poles, structures and associated hardware
UETTDRIS54A	Install and maintain poles, structures, overhead conductors and cables
UETTDRIS56A	Install and maintain low voltage overhead services
Rail Traction Pathway Group	
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
UETTDRIS52A	Install and maintain poles, structures and associated hardware
UETTDRIS54A	Install and maintain poles, structures, overhead conductors and cables
UETTDRRT21A	Install traction overhead wiring systems
UETTDRRT22A	Maintain traction overhead wiring systems
UETTDRRT23A	Install rail traction bonds
UETTDRRT27A	Install overhead traction components and equipment
UETTDRRT28A	Maintain overhead traction components and equipment
Distribution Cable Jointing Pathway Group	
UETTDRCJ21A	Lay ESI electrical cables
UETTDRCJ26A	Install and maintain de-energised

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Prerequisite Unit(s)	**4)**	
		low voltage underground polymeric cables.
	UETTDRCJ27A	Install and maintain de-energised high voltage underground polymeric cables.
	UETTDREL11A	Apply sustainable energy and environmental procedures
	UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
	UETTDRIS41A	Install network infrastructure electrical equipment
	UETTDRIS42A	Maintain network infrastructure electrical equipment
	UETTDRIS55A	Install and maintain low voltage underground services
	Electrical Pathway Group	
	UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
	UEENEEG006A	Solve problems in single and three phase low voltage machines
	UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
	UEENEEG063A	Arrange circuits, control and protection for general electrical installations
	UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
	UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
	UEENEEG109A	Develop and connect electrical

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Prerequisite Unit(s) **4)**

	control circuits
UEENEEK142A	Apply environmentally and sustainable energy procedures in the energy sector
UETTDRIS67A	Solve problems in energy supply network equipment

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare for substation switching to a given schedule	1.1	Switching and work schedule(s), including drawings, plans, requirements, established procedures, and material lists, are received, analysed and confirmed, if necessary, by site inspection.
	1.2	Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites.
	1.3	OHS policies and procedures related to requirements and established procedures for substation switching are obtained and confirmed for the purposes of the work to be performed and communicated.
	1.4	Work is prioritised and sequenced following consultation with others for completion within acceptable timeframes and in accordance with established procedures.
	1.5	Hazards are identified, OHS risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear according to established procedures.
	1.6	Relevant authority is obtained to access and perform work according to requirements and/or established procedures.
	1.7	Resources including personnel, equipment, tools and personal protective equipment required for the job are obtained and confirmed in working order.
	1.8	Relevant personnel at worksite are confirmed current in First Aid, Pole Top Rescue and other related work procedures according to requirements
	1.9	Liaison and communication issues with other/authorised personnel, authorities, clients and land owners are resolved to carry out work where necessary.

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ELEMENT	PERFORMANCE CRITERIA	
	1.10	Site is prepared according to the work schedule and to minimise risk and damage to property, commerce, and individuals in accordance with established procedures.
	1.11	Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities confirmed where applicable in accordance with established procedures.
	1.12	Road signs, barriers and warning devices are positioned in accordance with requirements.
2 Carry out substation switching to a given schedule	2.1	OHS and sustainable energy principles and practices to reduce the incidents of accidents and minimise waste are monitored and followed in accordance with requirements and/or established procedures.
	2.2	Lifting, climbing, working in confined spaces and aloft, and use of power tools/equipment, techniques and practices are safely followed and, currency according to requirements confirmed.
	2.3	Essential knowledge and associated skills are applied in safe substation switching to a given schedule to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements
	2.4	Communications with Switching Control Officer are established and maintained throughout the isolation operation according to established procedures.
	2.5	Electrical equipment and associated circuits line/network or work site to be switched is isolated and proved de-energised using appropriate devices, earthed where required and load transfer successfully achieved according to requirements and established procedures.
	2.6	Substation switching to a given schedule is carried out, in accordance with the work schedule and requirements/established procedures.

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ELEMENT	PERFORMANCE CRITERIA	
	2.7	Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported to the immediate authorised persons for directions according to established procedures.
	2.8	Unplanned events occurring during substation switching to a given schedule are responded to and undertaken within the scope of established procedures.
	2.9	Relevant permits are prepared and issued in accordance with established procedures.
	2.10	Known solutions to a variety of problems are applied using acquired essential knowledge and associated skills.
	2.11	Ongoing checks of quality of the work are undertaken in accordance with instructions and established procedures
3 Complete substation switching to a given schedule	3.1	Work undertaken is checked against works schedule for conformance with requirements and anomalies reported in accordance with established procedures.
	3.2	Accidents and/or injuries are reported in accordance with requirements/established procedures, where applicable.
	3.3	Work site is rehabilitated, cleaned up and made safe in accordance with established procedures.
	3.4	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
	3.5	Relevant permit(s) are signed off, safety devices are removed, and the system is re-energised and returned to service in accordance with requirements/established procedures.
	3.6	Works completion records, reports, as installed /modified drawing and/or documentation and information are finalised and processed and appropriate personnel and authority notified.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of performing substation switching to a given schedule.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TSB39A Power system substation switching operation

Evidence shall show an understanding of power system substation switching operation to an extent indicated by the following aspects:

T1 Installation of switchgear and associated equipment encompassing:

- Types and function of various switchgear - isolators, air-break switches, gas-filled switches, vacuum type, links, fuses, oil disconnectors, fuse switches, circuit breakers, operating characteristics, advantages and disadvantages of different types switchgear, installation procedures, earthing, requirements and techniques
- Types of equipment - transformers, reactors, regulators, capacitors, relays, surge arrestors, fault indicators and mobile generators
- Installation procedures for switchgear and equipment - standards, codes, legislation, supply authority regulations and or enterprise requirements, assembly and erecting procedures, earthing requirements and techniques, pole mounted locations
- Maintenance procedures for switchgear and equipment - diagnosing and rectifying faults according to electricity supply industry standards and procedures,
- Testing and commissioning - electricity supply industry standards and procedures.

T2 Low voltage switching principles encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching of low voltage to a given schedule
- Requirements for the use of manuals, system diagrams/plans and drawings - types, characteristics and capabilities of electrical apparatus, use, characteristics and capabilities of specialised tools and testing equipment, LV network interconnectors source of possible backfeed
- Low voltage switching techniques - identifying hazards, assessing and controlling risks associated with LV switching operations, electrical access permit(s), operational procedures, earthing procedures
- Personnel protective equipment (PPE) for LV switching

T3 High voltage switching principles encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching of high voltage to a given schedule
- Requirements for the use of manuals, system diagrams/plans and drawings - types, characteristics and capabilities of electrical apparatus, use, characteristics and

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REQUIRED SKILLS AND KNOWLEDGE

capabilities of specialised tools and testing equipment, network interconnectors source of possible backfeed

- Role of the HV switching operator
- Operational forms, access authorities and permits associated with HV switching - types of operational forms, access authorities and permits, purpose and procedure for operational forms, access authorities and permits.
- Use and operation of equipment associated with HV overhead and substation equipment - test instruments, sticks, interrupters, arc stranglers.
- Types and categories of HV switchgear
- Application, function and operating capabilities of switchgear
- Restrictions pertaining to HV switching equipment
- Procedures for the isolation of HV transmission main and working earths
- Earthing HV electrical apparatus practices and procedures for access - purposes of “Operational” and additional work part “on-site” earths, factors determining the location and effectiveness of “Operational” earthing, acceptable industry procedures, personal protective equipment, high voltage switching techniques.
- Operate switching apparatus - identifying hazards, assessing and controlling risks associated with HV switchgear operation, systematic and defensive techniques, mobile radio procedures, double isolation procedures.

T4 High voltage fault switching principles encompassing:

- Primary causes, effects and types of HV electrical faults
- HV protection devices - main components, types, categories, applications, functions.
- Basic principle of operation of HV system protection devices
- Protection co-ordination and protection “zoning”
- HV feeder auto-reclosing suppression – function, application
- Circuit condition requirements and switching considerations when paralleling and separating HV feeders.

T5 High voltage distribution transformer principles encompassing:

- Operation of HV distribution transformers - principle governing factors for transformer ratings, protection and alarms, operating limitations and the relationship between transformer and HV fuse rating, purpose and principle operation of HV distribution transformer tap changers, HV distribution transformer and transformer — cable combination switching practices, paralleling requirements, isolation and earthing procedures for access, common distribution transformer and associated electrical apparatus faults.
- HV underground switching equipment - arc stranglers, switch operation, load break elbows, switching cubicles, canister fuses, bayonet fuses, F and G switching cubicles, voltage indicators and phasing testers

T6 High voltage SWER system encompassing:

- Application and function of SWER system components

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REQUIRED SKILLS AND KNOWLEDGE

- Circuit arrangement
- Principle of operation
- Hazards and procedures associated with faulty SWER earth systems
- Procedure to isolate, energise and commission SWER substations

T7 Feeder automation system encompassing:

- Function of feeder automation system and the main components
- Operation procedure for a remote field device from a local control station
- Functions of “System Control and Date Acquisition” (SCADA) (or any other relevant Data Acquisition and Control) systems and its main components
- SCADA system security interlocks and access restrictions
- SCADA system operation when switching apparatus or retrieving data via a remote access device such as; Remote Access Terminal (RAT), Dial Up Voice Annunciated System and Local Control Station
- Function of the main components of a local/remote control system
- Operation of a field devices using SCADA systems via a Remote Access Terminal (RAT), Dial Up Annunciated System and Local Control Station.

T8 HV overhead and substation switching principles encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to HV overhead and substation switching
- Requirements for the use of manuals, system diagrams/plans and drawings - types, characteristics and capabilities of HV electrical equipment to be switched, use, characteristics and capabilities of specialised tools and testing equipment.
- Role and responsibilities of the HV switching operator
- Operational forms, access authorities and permits hazard/risk assessments associated with HV switching - types of operational forms, access authorities and permits hazard/risk assessments, purpose and procedure for operational forms, access authorities and hazard/risk assessments.
- Use and operation of equipment associated with HV overhead and substation equipment - test instruments, sticks, interrupters, arc stranglers.
- HV switchgear – types, categories, application, operating capabilities.
- Operation of HV overhead switching or indicating devices - fuses; disconnect fuses; load switching; live line indicators; capacitors; reclosers; sectionalisers, underslung links, airbreaks; switches, disconnects; live line clamps; phasing sticks; phasing tester
- Operation of protection systems and substation equipment - fault levels and settings; types and applications; protection systems and substation equipment fault levels and settings; types and applications.
- Restrictions pertaining to HV switching equipment
- Procedures for the isolation of HV mains and working earths - earthing HV electrical apparatus practices and procedures for access authority issuing; HV switching techniques.
- Operate switching apparatus - identifying hazards, assessing and controlling risks

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REQUIRED SKILLS AND KNOWLEDGE

associated with HV switchgear operation, systematic and defensive techniques, mobile radio procedures, double isolation procedures.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all component parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered

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will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET12". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of employability skills; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures; and
  - Demonstrated performance across a representative range of contexts from the prescribed items below:

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Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	**The minimum number of items on which skill is to be demonstrated**	**Item List**
A	All of the following:	Approvals/clearances Access permits
B	All of the following:	Operating sticks Operating earths Voltage detectors
C	All of the following:	Phasing equipment Ground equipment isolating handles and earths
D	Any one of the following:	Links Air break switches Fuses
E	Any two of the following:	Reclosers Ring main units Circuit breakers
F	At least one occasion:	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

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Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual substation switching to a given schedule.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment

9.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this Competency Standard Unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

There are no concurrent assessment recommendations for this unit.

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Range Statement

RANGE STATEMENT

10) This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall be demonstrated in relation to the carrying out of switching operations in a substation in accordance to a given instructions and switching schedule.

Switchgear includes ring main units, circuit breakers, isolators, earth switches, HV links, air break switches, capacitor banks, reactor banks, line/wave traps and fuses. (Refer to Definition 25)

Specialist tools include HV phasing sticks, HV link sticks, HV live-line clamp operating sticks, HV ground transformer isolating handles and associated earths, HV overhead operating earths and HV detectors.

Switching program/schedule including necessary detail, e.g. structure, switch or equipment number; locations; HV feeder; outage times; works plan/order.

The following constants and variables included in the element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect

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RANGE STATEMENT

- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Industry Specific Cross-Discipline Units

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